ANIMAL PRODUCTION

The livestock problems of Iran are vitally associated with supplying more and better feed, which must be made available before any improvement can be made in the industry which furnishes food, milk, clothing and motive power for the agricultural and urban people.

FEED SUPPLY

At the present time nearly all of Iran, the arid and semi-arid areas in particular, shows a striking lack of plant cover including grasses and shrubs. There is too much livestock for the feed supply, as is indicated by the large number of goats. Only hardy and active animals which eat woody plants can survive under these conditions.

Some type of grazing control is needed, especially in the foothills and mountain country. Such control would permit a certain amount of natural recovery of the native vegetation. The grasses especially would reappear rather quickly and in the end more feed would be available for the grazing animals. Recovery of the plant cover, of course, would reduce the problem of wind and water erosion discussed fully in this section under Forests and Ranges.

In addition to protection and restoration of the natural cover on range lands, supplementary feed must be provided directly and indirectly from the cultivated land. In general, the feed supply situation in Iran can be improved by:

1. Controlled grazing of livestock by rotation of pastures, careful shepherding, and by providing a series of camps away from villages, so that sheep and shepherd do not have to return to the village each night. Livestock grower associations should be organized to determine and fix the numbers of livestock to be grazed on the different range areas, to work out grazing schedules and the rotation of available pastures.
2. Reseeding of ranges to assist in re-establishment of natural forages.
3. Providing water at various places on the range where it is not now available, so that animals will not have to travel great distances to drink.
4. Supplying salt to livestock and placing it so that it will aid the distribution of livestock on the range.
5. The limitation of grazing on meadows and the harvesting and storing of native grass hays.
6. Developing tree crops like acacia and carob for browsing by livestock in the more arid regions.
7. Growing root crops like turnips and mangel-wurzels.
8. Raising more forage crops like alfalfa, clovers, and various grasses to provide pasture and hay.
9. The preparation of coarse forages to render them more palatable as feed with cutters, hammer mills, etc.
10. The growing of coarse forages like corn, sorghums, and sun flowers for storage as silage for livestock, particularly cows, buffalo, sheep and goats being kept for milk production.

11. Increasing the availability and use of feed supplements like cottonseed or linseed meal.
12. Utilizing the by-products of sugar factories, such as beet pulp, beet tops and molasses for feed.
13. Utilizing the by-products of flour and grist mills, such as "mill dust".
14. Utilizing the by-products of rice factories such as bran.

QUALITY OF THE LIVESTOCK

The production of more food and fiber per animal unit is of utmost importance. Effort should be directed toward producing livestock products of higher quality and more suitable for the use to which each particular product is put.

Selection from Native Breeds

The native breeds of livestock in Iran show remarkable adaptation to their environment and in some regions types of animals have been developed which are quite outstanding as compared with those in other areas of the country. The fat-tailed sheep is apparently a product of many years of natural selection in a country where there are many periods of feed shortage. The selection of the superior animals in the native breeds will give more immediate results than will the use of foreign animals for cross-breeding. The native breeds are adapted to local conditions and are more hardy than imported ones. The cross-breeding operation with foreign breeds is a complicated process which must be studied under research conditions before that program can be recommended. The widespread use of foreign livestock would require more feed and shelter than is now available in many areas of Iran. Thus it is recommended that the first step should be to select the superior animals in the native breeds, castrate the surplus males and make the fullest use of the sires which show prepotency in transmitting their superior characters to their progeny.

Increased production of food and fiber per animal may be secured by careful selection of breeding animals for appearance and performance.

1. Sheep should have larger, smoother bodies, broader loins and deeper leg of mutton. They should carry fleeces of heavier weight of uniform, less hairy fiber.
2. Cattle and buffalo should have larger, smoother bodies, deeper middles, broader loins and wider chests and muzzles denoting the ability to produce more meat and milk.
3. Goats should have larger, smoother bodies, with wider loins, deeper "leg of mutton" and large even-quartered udders. There should be a rigid selection of breeding goats to eliminate kempy fibres and to get a flexible hair coat and a soft undercoat of valuable cashmere. Goats should be fewer in number but bred and fed to produce more milk, meat and cashmere.
4. Chickens should have deep bodies with good capacity, well-developed breast and good width between the pin bones showing egg-producing ability.

Introduction of Foreign Breeds

Selection of native livestock is the first approach to the problem of higher performance and should receive first attention among the improved practices. As a later step the question of the introduction of foreign breeds for the improvement of the native stock should be investigated. That should be done only when the program of growing sufficient forage has been developed to take care of such improved animals and when the improvement possibilities of the local breeds have been fully explored. Crossing with foreign sires would be recommended only after a careful research program to discover the crosses which are practical.

Improvements in production may be made by the following practices:

1. The rigid castration of all males not needed for breeding.
2. The use of artificial insemination to make the fullest use of outstanding sires.
3. The formation of livestock improvement associations among both villagers and tribesmen which will set up herd laws to outlaw scrub sires and to sponsor and distribute outstanding sires. The keeping of performance records is essential to find out whether an individual is outstanding, either in his own right or as a sire of outstanding progeny.
4. The testing of foreign sires crossed on native breeds to compare them with selected native stock for performance in meat, milk, draft, wool and skin production.
5. Grading and sorting of fleeces into the finer and coarser parts to supply suitable material for fabric as well as carpet manufacture.
6. By holding livestock shows in the leading livestock producing areas and giving premiums for outstanding stock with good performance records. Not only the animals but also their performance records should be judged.

PRODUCTION AND MARKETING

The standing of an Iranian livestock producer in his village or tribe is determined largely by the size of his flocks. The opinion seems to prevail that it is more important to have a large flock regardless of the amount of income received from it. With the limited feed supplies available, livestock numbers fluctuate with weather conditions. When the grass is good livestock numbers increase and when, as a result of drought or severe winters, feed is scarce the animals die off in great numbers. This is a very wasteful method of producing livestock products, for much grass is used by animals which never reach the market. There seems to be no pattern for production and marketing. Among the tribes for instance, the male spring lambs are often taken from the summer pastures back down to the winter ranges where they compete for the grass with the ewes kept to produce the lamb crop for the following year. In many instances these lambs, which could have been sold in grass fat condition at the end of the first summer, are allowed to mature and are sold as yearlings or two year olds, if they do not die in the meantime from starvation or disease. One of the first tasks of the animal science section of the Research and Extension Institute should be to develop, and teach to the people of the villages and tribes, sound livestock production and marketing programs. These plans will, no doubt, differ widely from one area to another since they must be adjusted to differences in feed supply, the distances between summer and winter ranges, the condition of the ranges, and transportation facilities in relation to available markets.

These production and marketing plans must take into consideration the time of breeding as influenced by weather conditions and available shelter, and the form in which the product is to be sold. Some lambs, no doubt, should be marketed when very young for their fleeces, whereas under different feed and market conditions others should be sold as fat lambs weighing 35 to 40 kilos. Decisions of this type also will influence management practices with respect to the production of milk and derived products. If lambs are to be pushed for maximum weight at six months of age less milk will be available for butter, meat or cheese.

Marketing and transportation facilities also need study. Leaders of several tribes complained that peddlers take advantage of the livestock producers by paying less than market price for lambs and wool. In many instances they loan money to the tribesmen with the understanding that the loan be repaid in sheep or wool calculated at low prices, and with high interest charges. Since much of the livestock is produced in rather inaccessible areas, at considerable distances from market centers, most of the producers have little knowledge of market values. Plan funds should be used to develop improved marketing facilities and agencies and to make production loans at reasonable rates. Freight rate structures should be studied to make sure that transportation practices do not place livestock producers at a disadvantage as compared with other farmers. There is also a need to study the use of refrigerating equipment for marketing meats and dairy products.

LIVESTOCK DISEASES AND PARASITES

In Iran the control of losses of livestock from diseases and parasites is an important problem. It is estimated that the annual loss amounts to 1,500,000 sheep and goats (total population, 20,000,000), and 200,000 cattle (total population, 3,000,000 head). However, this loss of livestock, supposedly from disease, is no doubt due in some degree to the poor condition of the livestock resulting from the lack of feed and care. In some areas numbers must be reduced, for there is not enough feed to nourish properly the heavy livestock population. The disease control program should be concentrated in those areas where there is sufficient feed, for it is here that the best livestock is raised. A heavy concentration of livestock, particularly where the land is swampy, results in infestations of internal parasites and it is important to control these parasites along with the infectious diseases.

The health of the livestock can be improved by:

1. Providing sufficient materials and personnel for efficient and economical treatment by vaccination of a large percentage of the animal population in the areas with sufficient feed for normal nutrition and health.
2. Continual testing of new methods and materials for disease control.
3. Setting up special legislation for the control of livestock diseases like tuberculosis and brucellosis which impair human health when transmitted through milk.
4. Making available a reliable veterinary service in all major livestock regions; then teaching producers to follow the veterinarian's recommendations.
5. Proper disposal by burning or burial in quicklime of animals dying from disease. Eliminate the use of sick animals for food.

GENERAL RECOMMENDATIONS

The proper coordination of the science and practice of animal husbandry with the veterinary service will play a most important part in the renovation and improvement of the livestock industry in Iran. The following summarizes the important steps in order of importance:

1. Provide more feed for livestock.
2. Improve the local breeds by selection, breeding and performance records.
3. Hold livestock shows and exhibitions to acquaint the general public as well as the livestock people themselves with what a good animal should look like and what it will produce in food and fiber for human use.
4. Concentrate disease and parasite control in those areas where feed supplies are sufficient for normal nutrition, before trying to save livestock in arid, sparsely vegetated areas where there are already too many livestock for the available feed.
5. Introduce a vigorous program of animal improvement which will increase the production of meat, milk, eggs and wool through better practices in breeding, feeding, management and marketing.
6. Carry out the improvement program through the ostan stations by research and extension activities. The demonstration farms and the extension agents will play an important role. Special projects such as a disease control and animal improvement program and a program for inspection of meat and milk should help attain the above mentioned objectives.
7. Work with the grazing section of the forest service to develop improved grazing practices. Supervised grazing and reseeding are necessary to maintain and develop more vegetative cover. By control measures relieve the pressure on heavily grazed lands with little plant cover.

FORESTS AND RANGES

FOREST PROBLEMS

The forests of Iran have been badly damaged by charcoal burners and fuel gatherers. The under cover of the forests has been overgrazed and as a result has greatly deteriorated both in quantity and quality. Forests in the broad sense may be either timber forests or protection forests. Iran has both kinds, the timber forests being confined largely to the more humid Caspian area and to the western slopes of the Zagros Range.

Outside of the timber forest areas, devastation of the cover has progressed to an almost unbelievable degree. The forces of destruction have been overgrazing and the gathering of the small brush for use as fuel in the towns and villages. This is a national misfortune, having the consequence of magnifying the effects of flood run-off to alarming proportions. It is a well-known fact that flood run-off of water is accompanied by accelerated soil erosion. In appraising the condition of the forests and ranges it is important to remember that the destructive process has been going on through many years of recorded history and a reversal in the trend cannot be made quickly.

Erosion

Immense areas have suffered from accelerated soil erosion that has been speeded up by injury to the plant cover. Part of this erosion has been caused by running water, part by wind action, in many cases by both. But in almost 99 per cent of the area it stems from injury to the plant cover. The topsoil has been lost from large areas of good forest land as a result of cutting the trees for charcoal, followed by grazing. Erosion usually becomes more or less active when the tree cover is removed, especially if grazing holds the new growth in check.

The topsoil with its higher organic content is not only more productive but more efficient as a medium favorable to water percolation. With the topsoil removed, the subsoil is a poor substitute carrier of plant nutrients and a poor medium of percolation. Flood run-off increases rapidly, carrying great loads of silt; winds blow away dry topsoil, leaving coarser particles of sand and gravel. The soils suffering from erosion therefore have been reduced greatly in their powers to sustain plant life.

Whether wind or water is the force removing the soil, the finest and most valuable particles may move long distances in dust storms or in streams. In the more arid sections sands blow before the wind, eventually forming moving dunes that cover up kanats and farm land, block roads, and ruin whole villages. The result of the coarse sand and gravel debris left by flooded streams is an area unfit for cultivation. The finer particles of soil, however, are sorted out by water action and deposited in the form of alluvial plains in a band between the mountains and the inland salt marshes and between the mountains and the sea. These rich deposits constitute much of the agricultural lands of Iran.

To understand the current situation in Iran it is necessary to visualize the process by which these soils were formed. In the beginning the mountains of stone were, by some process, pushed high above the surrounding areas. On these steep slopes, by the slow processes of weathering, shallow soils were formed which were capable of supporting grasses and trees. This vegetative cover, once started, was a constructive force in the development of additional soil. The amount of vegetative cover thus developed was in proportion to the rainfall and ranged from a very light crop of desert plants in the more arid sections to the very dense forests of the Caspian slope.

As man came into the picture he commenced to change the processes of nature by using the plant cover as feed for livestock and as fuel. The cover was destroyed first in these areas near larger centers of population and along routes of travel. As more and more roads were built the forests were cut farther and farther back into the hills. In time the livestock spread to all parts of the country so that the effects of grazing became universal. The cover disappeared most rapidly in the more arid sections where new growth was slow. In the Caspian there still remain some areas of forest so far from roads that the timber has never been cut. In all of the Caspian slope new growth is rapid enough so that plant cover is maintained on cut-over areas that are not cultivated.

As plant cover has been destroyed through the centuries of man's activity in this country, erosion has been shifting the soil from the mountains down to the plains. There is evidence in Khuzistan to indicate that practically all of that province has been formed by the deposit of silt from the mountains to the north of it. Excavations at Shush for example indicate several layers of buried civilizations. This city was probably once on the Persian Gulf which in the meantime has been pushed back a distance of about 250 kilometers. The erosion process thus makes the mountains less productive but builds up

fertile soils on the coastal plains. Unfortunately this creates a water problem as too little of the rainfall now percolates into the underground supply in the denuded hills and the alluvial deposits in many areas are so deep that only a small percentage can be used for agricultural production.

The important problem for the future is to build up enough plant cover to conserve the water resources of the country, and to provide for the maximum feed for livestock. In the tree forest areas there is the added problem of using the timber to best advantage.

Overgrazing

Overgrazing weakens the choice forage plants and eventually kills them. Good perennial grasses are almost wholly absent in the foothill and valley zone of Iran in spite of favorable natural conditions. The roots of broadleaf herbs are much less effective in holding the soil than the fibrous grass roots. The decrease of good forage plants brings about an increasing intensity of grazing use. Instead of giving the plant cover a chance to recover, it must be subjected to more and more intensive use. This tends to leave only the coarsest, and most unpalatable, generally woody, species. Woody species are eaten more readily by goats than by sheep and cattle. Continuous severe grazing of the range therefore tends to favor a change from sheep and cattle to goats. Increase in the number of goats is the result of overgrazing, not the cause, as many people think. Goats, however, do tend to destroy the woody species as well as the grasses and herbs. Once begun, the processes of overgrazing tend to get worse and worse, and drastic corrective measures must be introduced.

An understanding of these difficulties and their causes opens the way for a program that aims to correct or lessen them. Part of the program deals with more effective organization, and part of it deals with the need for organized research. A part of it, however, calls for a change in such nationwide practices as the methods of cooking and heating, which is difficult to bring about. The stopping of injurious erosion in Iran is a vital necessity not yet fully recognized. While many understand the dangers of forest mutilation, effective prevention has not been worked out.

To be effective a program must combine education, good judgment, and vigorous action. The program recommended in this report covers all of these phases.

Injury to Forests and Plant Cover

Injury to the forests and plant cover of Iran has been of such a nature that the productive capacity of these important resources has been greatly damaged. The principal means by which it has happened have been (1) poor organization of the lumber industry; (2) excessive use of trees for timber, firewood, and charcoal; (3) injury caused by livestock; (4) injury by fire; (5) clearing the forest for cultivation; and (6) removal of scant desert vegetation on vast areas, by overgrazing and for fuel.

Lumbering Not Well Organized

The Caspian forests still contain a great supply of excellent trees suitable for large dimension timber. The predominating timber trees are oak and maple, which would produce high quality hardwood lumber. Almost no lumber is produced and yet half or more of the Caspian forests have been almost destroyed. It is disheartening to see mag-

nificent oak and maple logs cut into small pieces for charcoal production, but even more so to see logs 20 to 30 meters long and 1 to 3 meters in diameter left to rot, only the branches being taken. This situation grows largely out of the poor industrial development and poor control of the forests.

Uncertainty as to ownership of forest land and the tremendous demand for charcoal have been the main forces in causing the waste of excellent timber forests. Charcoal burning is done in the forest in small kilns and the charcoal transported by mules. Pack trails are of no value for logging. They are rough, go up hill and down, cross gorges and streams, and constitute the only access to the forest from the few highways and truck roads. More roads, however, before forest control is in operation, would merely be arteries from which still more mule trails would extend outward to permit the charcoal industry to ruin new tracts of fine timber.

There are no facilities for logging, no logging trails, no roll-ways or timber slides, and no transportation capable of handling logs. The pioneer practice of dragging logs with oxen or mules by means of chains is not followed. There are only a half dozen sawmills, all stationary in type; not a portable saw-mill was reported. Now that a large bed of coal may be developed on the Caspian side of the Elborz and mine timbers in large quantities will be required, portable mills seem the only sensible answer until comprehensive forest administration is in operation.

Use of Trees for Timber

A few of the tree species that are especially suitable have been exploited for sawed timber. During the period of military occupation, the Russians cut and removed large quantities of valuable timber, largely in the neighborhood of the Caspian railroad and highways. This devastated a strip several kilometers wide.

Local populations have always used firewood from the forest. Much has also been carried into the large towns to satisfy the demand for fuel. This has naturally helped to remove wood from the areas near highways.

A recent growth in the demand for charcoal in Tehran and other towns has been the greatest single factor in devastating the forest. Contractors for charcoal have organized transport by mules from kilns to depots where trucks are loaded. For 10 to 20 kilometers from every truck highway all the best trees have been cut. The small diameter trees and branches of large trees are the handiest source of wood for charcoal making. The kilns are small, requiring that the wood be reduced to 2 to 3 meters in length and to 10 to 20 centimeters in diameter. Sometimes large logs are split if that is easier than using small diameter material. Young trees are especially desirable as no splitting is required.

Several hectares around a charcoal kiln are denuded, often leaving tall coarse stumps and cut logs to decay. From two to three hectares of good forest is destroyed each season for each kiln, and there are thousands of kilns.

Livestock Damage

Herds of sheep and goats in the forest naturally congregate in the cut-over areas around kilns and eat the young shoots, killing the valuable forest species. The local charcoal burner often has a flock of sheep that his wife and children watch while he cuts

wood and tends the kiln. The aggregate destruction by this method is immense and goes on relentlessly year after year until in numerous kiln areas the good trees are eliminated.

Great injury is also done by lopping off branches of trees to feed livestock. Small branches of oak with fresh green leaves on them are stored for winter feed. Unfortunately when trees are lopped, rot organisms enter the cut surface and make their way down the trunk. The tree is therefore not only deformed and weakened but frequently dies of heart rot. A lopped tree is also an easy victim of tree borers.

Fire Damage

The broadleaf forests of Iran do not support the major forest fires so destructive to conifer forests in America. This is partly because the trees are not inflammable species, partly because of high humidity in the Caspian area, and partly because of the fact that in other parts of Iran the trees are far apart and fuel on the ground is too scarce to support major fires.

The largest oak trees far back from the highways, even beyond the zone of charcoal burning, are frequently deliberately killed by fires built at the base. In many cases, the trees are girdled and then fired. Men who graze livestock in the forest open the forest canopy by this means to let in sunlight, which stimulates the growth of grass, herbs, and small shrubs valuable as forage.

Clearing for Cultivation

Most of the forest has been destroyed on the flat land in the Caspian littoral and the land used for cultivation. Productive rice, cotton, tobacco and orchard lands have been made available in this fashion. It is proper that this should be so. Large areas still bear forest remnants, swampy sloughs are filled with weedy brush, and old channels are too rough to farm. Deforestation should be completed here, the swamps drained, the area smoothed with bull-dozers, and the brush removed with power machinery. It is estimated that 30 to 40 per cent of the Caspian plain needs one or more of these reclamation treatments. Such treatments will increase not only the area of cropped land but also the crop yields on the land now tilled. To allow such large areas of highly productive land to be largely non-productive is indefensible. Since the area is destroyed for forestry, the land should be growing high-value cultivated crops.

In the foothills, however, hillside farming is both common and dangerous. When forests are broken and the land is cleared for farming, their steep slopes expose bare soils to excessive erosion. Topsoils are lost relatively soon. Because subsoils contain low amounts of organic matter and no litter, sheet erosion or gullying will soon decrease the power of the land either to grow crops or to be reforested.

Removal of Desert Vegetation

The scant vegetation of semi-desert areas has been injured even more than has the forest cover. For many centuries grazing has been a major industry and has been conducted at the expense of the forage plants in the native cover. On the long stretches of foothills and on the valley range lands in the central plateau, almost all species of grasses have disappeared. These areas are dry, but not drier and hotter than many grass-producing ranges in the southwestern United States. That they once bore grass is proved by remnants in a few places.

Constant trampling of animals disturbs and loosens the topsoil, thereby making it more susceptible to wind action. The organic topsoil, always very thin in a dry region, is reduced still further or lost entirely. Moreover, close grazing results in almost no leaves or fine stems being added to the surface of the soil.

The woody desert species left after heavy grazing is further reduced by fuel gathering. Loads of desert brush are carried to cities on mules, donkeys, camels, and trucks. Great strips on both sides of highways are denuded of the aromatic desert brush. This brush is in great demand for baking, as it makes an excellent quick fire. The combination of overgrazing and fuel gathering strips the valleys and foothills until only a few small weeds and lichens are left. When this condition is reached the percolation functions of the soil are greatly lessened and the soil surface has no protection against soil blowing.

Damaged Watersheds

The loose leaves, twigs, and humus on the forest floor and the small vegetation comprise a soft porous sponge that readily absorbs the waters from rains and melting snow. This spongy layer, called litter, not only receives the precipitation water, but transmits it downward into the mineral soil. Soil under a litter layer has a crumb structure with channels between the crumb-like masses of soil. The covering of partly-decayed leaves and twigs filter out any soil particles in the water and thus keep the percolation channels open. When the protective covering is removed, the crumb structure of the soil is broken down and the fine soil particles clog the percolation channels. A single rain may in a few minutes close the channels of the soil surface so effectively that percolation is tremendously reduced. The storm waters then collect on the surface and stream down the slopes. Removal of the trees and smaller vegetation and disturbances of the litter layer, therefore, permit surface run-off to get started and aid in increasing it.

Where the plant cover is brush or merely desert shrub, the same principle prevails except that the litter layer is thinner. Undisturbed, natural soils even under desert vegetation have the porous crumb structure described for forest cover. The litter cover is so thin that much less disturbance is required to break it up than with forested soils. Dry, hot weather and strong winds expose the light-weight plant residues and fine soil to being carried off in dust storms. A rainstorm beating directly on desert soils breaks down their crumb structure even more readily than it does in forest soils, because the desert soils have so little protective covering and contain so little humus.

Watersheds with undamaged plant cover absorb most of the waters from all except the heaviest storms or the most rapid melting of snow. Injured vegetation on as little as 10 per cent of an area allows surface run-off to develop sizable proportions. When 35 to 50 per cent of the area is stripped of vegetation and the rest of it weakened, as is the case in Iran, flood run-off mounts rapidly. The spring of 1328 (1949) afforded a striking example. The broad alluvial fans were pouring flood waters down every channel and across the roads in many places. For days the roads were impassable to trucks and passenger cars. Everywhere the flood waters after moderate rains or from melting snow rushed down the slopes and poured into the salt flats in the valley bottoms. A high percentage of the precipitation was thus lost to the watersheds on which it fell.

The agricultural productivity of Iran resides in the combination of a fairly narrow belt of good land located on the long, gently-sloping alluvial fans and a supply of water for that land. This is the only safe agricultural land in the nation. It lies between the

foothills and the salt flat bottom lands. As soon as flood waters flow beyond this narrow belt of well-drained soil, they reach the salt-flat bottoms where the water is valueless because the soil is too saline to grow agricultural crops.

Low precipitation limits the water supply until it is the limiting factor in the agriculture of Iran. Flood run-off discards at once a large proportion of the natural waters. It runs off at a time of year and in such torrents that only a small part of it can be used for irrigation. It may increase or develop a malarial threat on the desert edge where it it forms a swamp. These flood waters are lost to the ground-water supply. On vegetated watersheds most of the water will percolate and at the same time furnish natural irrigation to the native plant cover. This will add to the supply of ground water in the zone of good soil. Wells can produce water by pumping only where precolation builds up a ground-water supply. If 30 per cent of the precipitation waters from an injured watershed go into flood run-off instead of 5 per cent on a vegetated watershed, the loss is equivalent to reducing precipitation by 25 per cent. It may be more serious than that, since evaporation losses are heavy.

Efforts to Control Damage

Apart from the protection of domains at various times for the purposes of hunting by kings and nobles, the record shows little systematic attempt to preserve forests. On the other hand, Iran has an age-old tradition of water conservation by means of storage dams, cisterns and kanats, and of ingenious devices for raising and utilizing water. Terracing and contour cultivation were rather fully understood by the ancients. Excellent examples of contour banking and terracing are found even where a reservoir has long since broken down.

The natural plant cover serves to regulate water supply, although plants use some of the available water. A maintained plant cover provides a long-term insurance against complete disasters such as those which have occurred in the past.

Only a few people are conscious of the relation between brush removal and overgrazing and the flash floods which so often destroy contour banks and terraces, and cover fields with gravel. Nor has it been fully realized how important desert and semi-desert vegetation may be in binding sandy soils and preventing dust storms. It is only recently that modern research has produced data that prove the great power of a roughened surface to prevent dust and sand storms. It is not surprising, therefore, that these matters have not received their full share of attention.

Most of the efforts of the past to control damage to forest and plant cover appear to have centered around the individual garden and the oasis-like village community. The high mud walls that provide seclusion and protect small areas from wind and from injury by livestock are typical Iranian efforts to deal with these problems.

The idea that the nomad, the shepherd, and the fuel collector held the key to soil, water, wind erosion, and dust storm problems, has not been developed or appreciated. No evidence can be found, therefore, of special efforts to control their activities.

During the period of internal activity which characterized the reign of Reza Shah Pahlevi, however, several foresters visited the country. They were impressed by the need for a proper organization and they made some suggestions of a general nature. No

successful attempts were made to examine and review the whole situation from a modern land-use angle, or to present the proper picture to the Government. During that regime, however, major abuses of the forest were prevented. Unfortunately, state forest reserves were not created at that time. During the war period, extensive destruction and over exploitation of forests occurred in the Caspian area. One lesson learned was that the building of roads only exposed other parts of the forests to exploitation.

The Iranian Government very recently decided to set up an Independent Forestry Corporation on lines similar to the Independent Irrigation Corporation with control by a board, including a representative of the Ministry of Finance. This arrangement allowe funds derived from forest taxation to be utilized for forest work. Governmental interest in forestry and soil conservation has been aroused as never before. The situation seems favorable for the development of a sound forestry program.

FOREST POLICY

Principles

The forest service, which is charged with execution of a forest program, should have a well-defined policy. With changing governments, it is necessary that guidance be provided in a written statement of principles and policies that will enable particular situations to be dealt with in conformity with recognized procedures. Without such a statement, no forest department and therefore no forests can be considered as safely established.

The main principles underlying a forest policy are outlined in the following paragraphs:

1. Privileges of individuals or small groups must be limited when their exercise interferes with the right of the community. For example, the starting of erosion by a small grazing community may lead to destruction of cultivated land. The privilege of lopping trees for fodder may result in the community being starved for timber because the trees are being killed.

2. Permanent rather than temporary welfare must be assured. Clean cutting of a forest may destroy or greatly reduce a community when the forest no longer exists. Security from floods and some assurance of a living income from local industries derived from forestry are desirable.

3. Annual forest yields should be sustained at the maximum level. Sustained harvesting is a basic principle to forest management. It involves removing only the natural annual increment of the forest. The maximum yield level determination relates to the necessity of improving soil and soil moisture conditions in the forest as they affect the production of crops on cultivated areas. A better forest environment increases yields and improves the standard of living of the people.

4. Since only the state can invest capital in long-term developments, such as forests, to guarantee sufficient continuity and security large tracts should be held under state ownership. When water is a limiting agricultural factor, the responsibility for safeguarding supplies is sufficiently great to demand state attention and control. This, however, does not rule out private ownership of large forests where state supervision and control in certain respects is allowed.

5. Livestock management, irrigation, and the general process of soil conservation are influenced by the forestry program. Single method techniques in soil conservation have failed elsewhere, and soil conservation in Iran should be developed as an integrated scheme in which forestry plays a vital role. Farm forestry, to provide shelter belts, windbreaks, and farm woodlots, is related closely to agriculture and it should be administered by the Research and Extension Institute.

6. To conserve timber supplies and plant cover, it is desirable that substitutes for charcoal and brush be widely used. It is unreasonable, for example, to prohibit fuel removal if no substitute exists. Laws must be simple but capable of enforcement. A forestry program may put shepherds or charcoal burners out of business. If that happens, substitute employment in the forest department itself or compensation on a liberal scale should be given. Village fuel areas must be organized under the supervision of the extension service. These are eminently practical matters, requiring a sensible solution.

7. Since the success of a forestry program will be determined in part by the degree to which it is understood by the people, education in forest problems is therefore a limiting factor in the rate of progress. It is essential in executing forest reforms that the department have its public relations section to inform the people affected by forest restrictions that there are benefits as well as penalties. Provision for developing public relations must be made in the forest budget.

8. In forestry, as in other activities where climatic hazards make survival a gamble, reserves are desirable and should be built up. Good forests are a national reserve and buffer in time of stress for timber, fuel, employment and fodder. They constitute a reserve against floods and soil erosion.

9. Because the contribution of forestry to other land use programs is of great value, the costs of forestry must be considered accordingly. The value of the manure made available for agriculture by the substitution of wood as a fuel cannot be expressed accurately in terms of money. The establishment of forests is an act of faith in the future of the country, and one of the soundest measures of introducing economic stability that can be devised.

Objectives

The objectives that will be attained by the application of the above mentioned principles are:

1. Conservation of soil and water.
2. Protection from such calamities as floods, sandstorms, avalanches and wind damage.
3. Production of timber, poles, fuel grass and minor forest products.
4. Provision of desirable features such as shade, windbreaks, wild life and recreation.

The introduction of the modern concepts of farm forestry and village fuel areas should fill an immediate need in Iran. It will require co-operation between agricultural and forest authorities. A modern concept should have for its purpose the saving of the protective vegetation and providing wood for fuel and for other farm uses. Iran is

fortunate in having left vast areas where remnants of forests still persist and which need only protection to be recreated. Proper management (which can increase greatly the returns from forestry) is all that is needed to restore the magnificent forests of the Caspian area.

Basic Considerations

Time Factor

The present destruction of the existing forests is so rapid that one estimate indicates the complete removal of the best timber in the Caspian area in 15 years.

Already during the past seven years, roughly one-fourth of these forests has been practically ruined and will require a long period of rehabilitation. The remaining 2,700,000 hectares are being steadily reduced. The rate of destruction was accelerated during the war, and the use of trucks and building up of a large charcoal industry have maintained that high rate. Valuable oak forests in the Zagros Mountains are rapidly deteriorating. The dry forest types of great value in the south and southwest are being ruthlessly destroyed by fuel and charcoal exploiters.

Roads

During the regime of Reza Shah Pahlevi, roads and railroads were constructed which tapped major forest areas, until then largely unknown to the outside world. Restrictions at that time prevented the wholesale exploitation of forests that might otherwise have resulted. Now that many of the restrictions have been removed, and non-observance of others allowed to go unchecked, a dangerous destruction has arisen. This demands that control be introduced first into the areas closely affected by these main roads and railroads.

Fuel Needs

Apart from the usual requirements of every agricultural country in timber, poles and firewood, Iran has a special need for charcoal. The Iranian winter is severe; and specialized modes have developed of heating homes and water for bathing. In these, as in cooking, charcoal has been widely used for centuries. A clean, concentrated and convenient domestic fuel is essential for the maintenance of a reasonable standard of living. For ovens producing the characteristic Iranian bread, the use of the highly inflammable aromatic desert shrubs and dry roots of arid-region vegetation is highly adapted.

Factual Data

Most of the basic information needed in forestry is lacking in Iran. The introduction of control must be preceded and accompanied by fundamental research in policy of government, choice of areas, establishment of ownership, survey and mapping, and studies on rate of growth, stand densities, volume per hectare and rates of regeneration. The forest comprises both the capital and the return from the capital. Until the volume, composition and rate of growth of the forest is known, the increment that it is legitimate to harvest cannot be ascertained. This matter concerns the most fundamental principle of forest management, that of the sustained annual yield.

Land Ownership

A major obstacle in creating a forest reserve is the disputed ownership of forest land. In the Caspian area, more than one-half of the forest land is said to be the subject of dispute. So long as the title to so much land remains uncertain, a strong incentive exists to exploit forests. In any country, delay in constituting state forest reserves increases the difficulty of doing so. Here the local circumstances greatly increase the dangers of delay.

Organization

Another difficulty in the way of establishing forestry is the lack of proper organization. The present service is utterly inadequate for the tremendous task of establishing and protecting the forests. It consists of only one properly trained forest officer with a small headquarters staff of three assistants, one man in each of the provinces working as an assistant to the Director of Agriculture, and about 140 subordinates, of whom some 40 are based in Tehran. There is practically no transport or housing. All that this small staff can do is to help in the formal issue of permits. The rates of pay are so low as to make it tempting for subordinates to be dishonest. The annual expenditure on forests is Rls. 4,000,000 for personnel and Rls. 1,000,000 for plantation work.

Continuity

Continuity in management, so vital in importance in any long-term work such as forestry, has hitherto been lacking in Iran. The frequent changes of ministers have brought about frequent changes in policy, which have often retarded progress.

Co-ordination

A serious impediment to development has been a lack of co-ordination between the departments dealing with agriculture and similar land-use subjects including forestry. In making proposals for the future, it is necessary to ensure better co-ordination. Another obstacle is the general lack of understanding of the importance of forests in the national economy. Until the public, and particularly the Government, understands and appreciates these matters, the task of the forest service will be extremely difficult. In arranging a plan, it is essential to have an active public relations, or extension service to smooth the way for executive measures, and to make reforms administratively practicable. The people must aid in planning. The forest department cannot be expected to introduce unpopular reforms unless it informs the public concerning the advantages of its long-time program.

Range Management in Forestry

Range management is a comparatively new science, but it is of vital interest to Iran. There can be no long-term solution of the forest problem without solution of the range management problem also. The control of range lands situated in or near the state forests must obviously rest with the forest service for administrative reasons to avoid the results of an inevitable clash of interests. Ideally, many present range lands should be under forest management. On the other hand, there are forested areas that are more suited to range management. The need for educating the tribal population of 4,000,000 nomads and semi-nomads is urgent, and procedures are sure to be complicated. The collaboration of animal

scientists and forest authorities is necessary. The range question is of such importance that it is dealt with under a separate heading.

Training

The almost total lack of trained men means that a large proportion of the funds available in the beginning should be devoted to the employment of foreign experts and to the training of Iranians. The cost of training, like that of research, will therefore be higher in proportion to the general expenditure than it will be when the organization is fully developed.

Government Support

Forestry needs the support of Government at the highest level. It involves quick and sometimes delicate or comprehensive decisions on matters of policy at a high level. This has in part been provided by organizing a forestry service under the Ministry of Agriculture. The forest officer is the actual manager of state land, and he must serve the owner, which is the Government. This involves the need for "esprit de corps" among foresters, in order to get them to make proper decisions under difficult situations. Frequently, occasions arise when the sense of service to the nation enables the forest officer to look beyond an immediate pressure group, and see what is required for the permanent welfare of the people as a whole.

RANGES

Over long periods of time the natural grazing areas of Iran have been used according to the convenience of the men who handled the livestock. This has led to overgrazing on most of the areas used. An analysis of the grazing problem shows that the various types of grazing areas must be considered separately.

Grazing in Caspian Area

Grazing in the Caspian area is true forest grazing. Over-use results in injury to the forest and to the soil by erosion. Sheep, goats and cattle graze on the forests, where vast quantities of feed may be used with careful management without much injury being done. Now, however, the animals are concentrated largely near charcoal kilns and this works havoc on the young tree growth so essential to regeneration. On numerous cut-over areas, young trees of valuable species, especially the climax oak, practically all have been killed. In wide, irregular margins beyond these kiln areas, the young trees are badly bent, bruised and scarred. Oaks are most seriously injured because the leaves, twigs and young shoots are palatable.

Even under the gentle Caspian rains (120 centimeters per year), naturally very favorable to grass, eroded areas are appearing. Hillside cultivation is practiced by the local livestock men, who are generally in the charcoal business also either as kiln operators or transporters. It is remarkable how generally this pattern prevails, how inevitably the oaks are killed, and how coarse brush of inferior value comes in. In the eastern Caspian area, hillside farming is more quickly ruinous to the soil, because there are more frequent rains of the downpour type. Grazing takes place on about 4,000,000 hectares or more of land in these regions when non-forest and forested areas are combined.

Grazing in Arid Region Forests

Forest grazing in the drier northwestern and western forests causes injury more quickly and more disastrously than in the Caspian forests. The plants under the less dense stands of oak trees are more quickly injured because the low precipitation (around 40 to 50 centimeters) induces slower growth. At frequent intervals, completely bare areas with rough rocky surfaces are evident. Sheep and goats under the care of herders are bedded repeatedly on the same spots. When heavy rainstorms of the downpour type strike such areas, the waters quickly accumulate, floods rip out gullies, and boulder-strewn channels are a common sight. The combined injury of tree mutilation by charcoal burners with that caused by grazing makes a sad picture. Good grass remains in only a few areas which are difficult for animals to reach. No areas were found or could be learned about by inquiry where grazing is not severe. There are 11,000,000 hectares of this sort of open-forest grazing, largely in the Zagros Mountain region, from Azarbaijan to Bushire on the Persian Gulf, and beyond Kerman. Considerable areas also exist in Khorassan.

Tribal Grazing

In the spring, summer and fall, tribal grazing is largely in the arid oak forests. In winter, however, it is confined to the lower non-forest country where winters are mild. Grazing use is tremendously unequal, depending on the location of watering places and the slightly elevated ridges where sheep and goats congregate on the sunny south- and west-facing slopes. Repeated bedding on the same spot for many nights causes an intensity of grazing that kills out the most palatable plants. When dry weather prevails, dust storms carry away the fine soil loosened and exposed by grazing. The top soil, 5 to 30 centimeters in depth, has been removed on hundreds of ridges. Occasional heavy rains in the regions have washed gullies in the drainage channels.

Numerous conversations with stockmen, the tribal chieftains, and other informed persons all bear out the impression that these people do not realize that the ranges are being damaged. Much of this injury is of recent origin as witnessed by the straight-edged gullies and the spots now in process of losing topsoil. Here the dark colored topsoil stands in tiny raw-edged cliffs 5 to 30 centimeters in height on top of a compact, white, lime-rich subsoil which produces only about 20 to 30 per cent as much vegetation as the dark-colored topsoil. Grasses are practically non-existent on the light-colored subsoil, but rather abundant on the areas with a preserved topsoil. There are probably 3,000,000 hectares of this range type in Iran.

The winter and spring non-forest ranges of the tribal grazing lands are either already in bad condition or rapidly becoming so. The summer ranges are reported to be better. Some of the streams flowing from these ranges, however, are excessively muddy, suggesting serious overgrazing higher up in the mountains.

Grazing in the Mountain Valleys

The Hamadan area is an example of a region where forage production has been decreased largely by the destruction of valuable perennial grasses. Intermediate wheat grass, once apparently abundant, is now found in only a few spots that are protected from severe grazing. Erosion is not marked and the soils are well preserved. They would produce good grass if reseeded. In mountainous areas there are many valleys of this sort where species of drought-resistant grasses would produce abundantly. In the western

United States the yields of forages are 5 to 12 times as great after artificial seeding as on unseeded damaged ranges. It is estimated that 1,000,000 hectares of Iranian range belong to this class.

Grazing on Arid Foothills

Around 30,000,000 hectares of arid lands are grazed. Much of this land is reported as waste, but all land is grazed at some time during the year. These ranges are all severely overgrazed. Much of the woody aromatic brush has been harvested for fuel. The combined destruction from overgrazing and fuel gathering exposes this land to water erosion in the foothills and to wind erosion in the more arid valleys. The floodwater run-off and soil blowing are becoming worse. Next to forest management on the principal watersheds, management of grazing on these foothill ranges and desert valleys is of highest importance.

Range Administration

As part of the forest policy, the protection and revegetation of range lands should be made a part of the program of the Seven Year Plan. So dangerous is the destruction of natural plant cover that Iran can not make proper improvement in agriculture unless it is protected. The needs fall into two categories: the first, to organize control over ranges to allow the natural vegetation to grow; the second, to seed grasses and plant windbreaks in critically needed places.

Of necessity the forest service should be the agency authorized to control grazing on forest lands that are put under management. That authority might be extended to include grazing on all other types of forest. The reasons for doing this are that the forest service will have to manage the forestry operations and it can manage grazing more effectively on these lands. The tribal grazing lands not in forests represent only about one-third of the grazing lands used by these people. A second agency to manage these non-forest ranges would only confuse the tribesmen who use both types of range.

It is important, however, that there be complete co-operation between the forest service and the animal science department of the Research and Extension Institute. The animal science specialists of the extension service should work closely with both the village and the tribal livestock producers. They should be in a better position to gain the good will of these people than anyone else. In connection with the program for animal improvement and disease control we recommend that a group of three extension specialists travel with mobile units among the tribes. One person in this group should be a specialist in range management. It is recommended that for the first years of the plan the efforts be restricted to an educational program and that regulatory work be delayed until the confidence of these nomadic people has been secured. Eventually, national legislation will have to be enacted to control grazing.

Objectives

The immediate objectives of grazing management are to prevent the destruction of plant cover where it is still intact and to restore it where it has been damaged or destroyed. When accomplished, this should result in increased forage production and decreased wind erosion. As already explained, these are essentials in the program of national welfare.

Fortunately, both purposes can be accomplished by the same conservation measures. The measures can be simply stated but they are difficult to carry out. By restoring and maintaining a good plant cover the quantity and quality of forage production will be increased. To do this the following are requirements:

1. Stop fuel gathering.
2. Reduce the amount of forage removed by animal grazing to about 60 to 70 per cent of the current annual plant growth.
3. Reseed ranges where valuable grazing species have been largely destroyed.
4. Develop watering places at distributed places on the range.
5. Provide shelter for animals where needed, especially for lambs.
6. Put managed grazing in operation including rotation, deferred and seasonal grazing.

The real problem lies not in the analysis of the difficulty, or in knowing what must be done, but in developing a practical plan which will achieve the desired changes. The fact that changes are necessary in basic practices of living on the part of large numbers of people, presents a real obstacle. Substitute fuels (coal and oil) will help to reduce and finally eliminate the use of desert vegetation for fuel. The second requirement to reduce the intensity of grazing for a few years until the vegetation is restored to vigorous growth will require the most determined effort. The other restorative practices recommended also will require consistent attention before real results are achieved. Once done, however, these management practices will pay large and lasting returns. The ranges of Iran are capable of producing two to five times as much forage as they do now.

It has taken the western United States some 40 years to achieve a part of the foregoing objectives. The cure can not be obtained in one grand stroke. As in curing a man of injury, the doctor merely provides favorable conditions for nature to do the work. It is logical, therefore, to start the program on a vigorous but conservative basis, with the idea of increasing the effort as favorable opportunity arises.

Personnel

The suggested personnel for a vigorous campaign to increase forage and to lessen wind and water erosion is as follows: There should be a national director of grazing (foreign) responsible to the director of forestry. He should have an Iranian assistant in charge of the grazing administration. Four regional grazing officers should be provided. All of these persons should have foreign advisers. The regional grazing officers would be in charge of the program for major geographical units. Each regional grazing officer should have under him four grazing supervisors who would in turn be assisted by four rangers.

The functions of this staff should be to provide for controlled grazing of the range, and to aid in the substitute fuel program. The chief of grazing and his four regional officers should develop the program, which would be administered by the grazing supervisors and their rangers. One grazing officer should be selected in each tribal area to co-operate with the extension service in working on grazing problems among the tribal people.

RECOMMENDATIONS

Short Term Program

We recommend that special emergency powers be given to the Minister of Agriculture which he can delegate to the director of the forest service (for a period of one year) which will enable him to deal with abuses and dangerous practices in the forest areas in a summary fashion where necessary. Obvious breaches of discipline or honesty, or procedures inimical to conservation, should be handled in such a way as to bring the situation under control.

We also recommend that special legislation be passed to stop the process of transferring national forest land to private ownership. All areas transferred in recent years should be subject to review by a regular commission, and provision should be made for establishing state-controlled forest and grazing areas.

An experiment station should be established by the Research and Extension Institute at Zirab, or at some more desirable place.

Contingent on the above, steps should be taken to set up a first unit of forest administration within the current annual budget, with other units to follow as soon as practicable. The first unit should be one division of approximately 200,000 hectares, set up with the following objectives:

1. To start effective physical control in a selected area and provide a center for experimental and training work.
2. To provide a full scale model of forest administration to gain experience for further expansion.
3. To provide in-service training for all members of the technical staff during the first year.

Some temporary housing both for staff members and touring officers in line of duty is needed. Extensive use of tents is possible and temporary quarters should do until permanent buildings are erected. Adoption to the maximum extent of local material and pattern is advocated.

About 100 extra men will be needed to check the charcoal kilns. At least it should be made certain that only registered kilns are operated and that abuses, such as illicit removal by truck, are stopped.

We recommend that classification of positions with grades on the merit system be instituted at once. This should be accompanied by an immediate increase in the salary scale adequate to enable men to live on their pay without having to resort to supplementary employment, or to bribes.

To make the first appraisals of the situation and the first introduction of control it is necessary that motor transport be provided. A transport section should include two 3-ton trucks, one station wagon, six jeeps with trailers and four motor-cycles. Certain equipment such as survey instruments, maps, and miscellaneous tools should be ordered at once. Acquisition of library and office supplies should be started soon.

Long Term Program
Government Policy

We recommend that the forest and range policies of the Government be stated and formally approved by the Government as soon as possible and that they be included in the Constitution.

We recommend that the Government appoint a high level commission and a special court to examine and settle outstanding claims to land ownership. The court should take the advice of the forest authorities regarding the importance of specific areas. The forest limits should consist, in so far as possible, of well-defined natural boundaries. They should be marked on available maps, and on the ground as soon as disputes are settled. The commission should endeavor to obtain control of areas of land indicated as being of particular importance to the forest department. Compensation for loss of right should be as liberal as possible. If necessary, land should be purchased. It is desirable not to perpetuate private rights in Government forests, as numerous or large islands of private property within the boundaries of forest control units make administration difficult.

General Organization

We recommend that a general forestry organization be set up as soon as possible to be financed by the forestry budget in the Ministry of Agriculture.

The recruitment of foreign advisers as indicated should be started and continued as rapidly as circumstances permit. It is suggested that 15 foreign experts be employed by the end of the second year of the program with this number to be increased as the work expands. They should be men with experience in forestry management and in good physical condition. The group should include one man with experience in soil conservation work, and one man with experience in range management.

The foreign staff furnished by the Research and Extension Institute should be of high quality. Foreign experts will be needed in the following fields: silviculture, range research, economic research, inventory and utilization. Each foreigner should have as his collaborator, assistant, or understudy, an Iranian, so that the work will be given continuity when the changeover occurs. It is urged that all foreigners be encouraged to learn the language by the provision of a colloquial language bonus. Free housing and the use of an automobile should be provided. It is emphasized that first-class forest officers are in short supply, as many countries are creating or expanding their forest services. Very young men are not suitable, nor are too many elderly men. A loan from existing services is the only practical method of obtaining many of the active officers wanted.

When the first four main branches are set up and the first territorial unit of management is organized, the objective should be the steady extension of detailed control by the setting up of more units until a full region is established. Then a unit of the second region can be started and similarly expanded. It is hoped that by the end of the Seven Year Plan three complete regions, two in the north to cover most of the Caspian area, and one in the south or west, perhaps at Kermanshah, will be under this territorial control.

It is recommended that a chief of grazing be employed to organize on a broad scale four regional units in range management as described later in this section.

The bringing under better control of the forest areas not included in "units" needs to be effected at once and should parallel the short-term program. That should

be done by the recruitment of a special staff of 100 well-chosen forest guards. Those men should be chosen from the shepherd, charcoal burner or mountain tribesman groups. They should enforce the existing rules regarding registration of charcoal kilns and marking of trees, which are ignored at present. A few examples may have to be made of the more flagrant offenders, to introduce the beginnings of respect for the law. Care should be taken to see that adequate warnings are given and that cases are dealt with firmly but fairly.

Personnel

The Iranian staff to be recruited will be of three grades. In the first category are men from 20 to 25 years of age who are graduates of Karaj or who hold an honors degree in a natural science. These should be selected on grounds of physical fitness and suitability for outdoor life, and sent abroad for a two-year course in forestry to obtain a master's degree. Some of these men should be trained in range management in a country where grazing control is practiced.

The second category will include men trained as rangers. Twenty men should attend a special course at Karaj for one year. These students should live together and do their work and training in a body. This is necessary to develop "esprit de corps" and discipline.

The third category will include forest guards, to be trained at two forest guard schools, each handling 50 men. They can be located during the first year in the first forest division in temporary quarters.

The forest guards course need be for one year only during the first seven years, in view of the urgent need for trained men. Candidates should be literate and able to pass a simple entrance examination. Too great insistence on a high standard of education would tend to eliminate many of the open air men who are most suitable. Care in selection from this standpoint is essential.

The training must be largely carried out in the forest itself or on the range as the case may be. Equipment should include trucks and tents to enable students to live in camp for extended periods. Each course should have a medical officer attached to it.

Maps and Statistics

A supply of all available maps should be obtained from various sources and properly housed in a section of the main office for issue as required. Special printing of the largest available scale map is needed to produce a convenient map for immediate issue to subordinates.

The air survey on a 1: 50,000 scale of most of the important areas of forest in the north and west will provide a useful general map for woodland use, classification, and preliminary selection of areas. The 1: 10,000 scale air survey should provide a good map for the purpose of forest inventory, classification, and the development of a general working plan. A survey should be made as soon as possible of the first region in the north to be brought under control, and when that is done a second region should be mapped. Ground control must be arranged. Surveying and mapping is covered in a following section in this volume and the subject of statistics in Vol. V.

Forest Produce

The whole timber business needs overhauling from logging to marketing. It should not be changed so drastically, however, as to upset it completely. The obvious beginning should be in the divisions and regions to be brought under control. Small portable mills and a seasoning plant are advocated. The ultimate policy should be to let private enterprise handle exploitation, but this can be permitted only in forest areas which are under complete control.

The present volume of timber exported from the forests can be maintained without damage to the forest if charcoal burning is reduced and fuller utilization made of the trees which are overmature, badly grown, or mutilated. In units under control the annual yield will be ascertained as soon as possible by the usual methods of volume of increment measurements. Elsewhere a very rough control by area should be attempted, with the department working in provisional felling units over limited areas pending gradual spread of controlled units of administration.

Buildings and Roads

The buildings required should be provided in the form of temporary structures put up as quickly as possible. They should be replaced, in accordance with the Seven Year Plan, by permanent structures of a standardized pattern. The purposes for which they will be required will be staff quarters, inspection houses, schools and a research station.

Extraction roads should not be provided until forests are brought under control. However, it should be an excellent thing for inspection paths to be aligned and constructed on 1 in 15 to 1 in 20 gradients in preparation for fair weather motor road construction later.

Fire control should be standardized by the use of protection units which should be organized as soon as reserves are established. Most of the forests of the Caspian area are broadleaved and not particularly inflammable except in dry years. Special measures should be taken, however, in forests of cypress and juniper. A system of look-out posts should be provided, and the usual methods of reporting and fighting fires introduced.

Equipment

Transport vehicles, tools, and machinery should be provided as required. Simple articles, strong rather than complicated, are needed. For these and such other items the advisers should be consulted. Communications are essential for proper control. They must be provided either by telephone or radio and developed in detail in units of forest management. There should be installed at the research station a complete set of meteorological equipment, and, at intervals over the unit, a series of rain gauges. Rain gauges should be located at other critical places to give as wide coverage as possible. Forest officers should regard the collection of meteorological data as part of their duties. The subject of meteorology is covered later in this volume and communications in Vol. IV.

Fuel Substitutes

It is strongly recommended that a campaign, similar to the very successful one executed in Cyprus, be initiated immediately to popularize the use of oil fuel or some such fuel as coal briquettes, to replace charcoal. This should reduce the manufacture of char-

coal to a quantity which can be produced on a sustained yield basis from material suitable primarily for that purpose. An officer from the utilization branch should be sent to Cyprus as soon as possible to learn the lessons which are available there. (Exhibit C-8.) The section in charge of this work should proceed in cooperation with the Anglo-Iranian Oil Company and the publicity section. The more effective distribution of oil needs to be developed along with the substitution program. A truck fitted as an exhibition van will be needed. Arrangements should be made to measure the consumption of fuel oil as it is substituted for charcoal and brush wood. The greatest effort should be made to bring about a change to oil fuel in the case of bakers' ovens, lime kilns, brick kilns, and other big consumers of desert scrub and bushes.

Extension Work

The Research and Extension Institute should provide suitable personnel to develop a vigorous program in forest and range management in all areas where a problem exists. They should give special attention to farm forestry and village fuel plantations. This work will be implemented by the programs of the agricultural demonstration farms, stations and substations. The extension specialist and extension agents should work out details of village fuel schemes and promote their use. The purpose of these schemes should be to provide cheap wood fuel to replace the manure, farm products, desert scrub or fruit trees which are at present being used for fuel.

Publicity

Forest publicity, including the use of films, radio talks and published articles, is so needed in Iran that a professional publicity man should be employed. A publicity library and a film library should be built up. A traveling truck fitted up to show motion pictures is needed. This could be combined with the oil fuel conversion program.

A forest museum should be opened in a forest demonstration area near Tehran to promote public interest. Specimens of timber working models to show saw milling, logging and soil conservation practice would be desirable. A relief model of the whole country on 1 : 50,000 scale is recommended as a part of the exhibit material.

MECHANIZATION

PRESENT FARMING METHODS

Use of Manpower

The condition of the Iranian farmer would be much better if cropping and livestock practices were improved to increase the amount each farmer produces. Iranian farmers need more income to provide better food, clothing, shelter and sanitation for their families. Income depends upon production. A farmer must produce more than his family eats before he can have a cash income.

The production per worker on Iranian farms is too low to provide an adequate income because the tools and methods in common use are the same as those employed for several thousand years. They require a tremendous number of man-hours per hectare which results in a very small area farmed per worker.

In producing food, as in many other industries, the use of power is of first importance. It takes power to do work and it is important that the power used be economical. In Iranian agriculture humans supply a large amount of the power, and the human being produces power at a very high cost. For instance, a strong man can produce only 1/10 horsepower. If he works 10 hours he produces 1 horsepower hour of energy. His pay is about Rls. 32 which makes a cost of Rls. 32 per horsepower hour. On the other hand, a farm tractor will produce 1 horsepower hour of energy on about ½ liter of motor fuel which costs about Rls. 2. Even when costs other than fuel are added it can be seen that man cannot compete with motors in producing power.

A simple formula illustrates the above discussion:

$$I = (P—C)\ Q$$

I = Income
P = Price received for a kilo of product
C = Cost of producing a kilo of product
Q = Number of kilos produced

The farmer can do little about the price he receives for his product. He has some control over costs, but usually that control is limited. The one factor that a farmer can control, however, is the quantity he produces. The quantity can be increased greatly when the area farmed is increased. A farmer who can work only 3 hectares by hand methods can farm 50 to 100 hectares with a medium-sized tractor and proper machinery. When tractor power is used it is very important to have the necessary machines to go with it. Tractors and machinery should be used as much as possible to perform every operation in the growing and harvesting of a crop. It is uneconomical to do only one or two operations with machinery while relying on manpower for the others.

The introduction of better hand tools is not to be discouraged; in fact, some such equipment is needed. However, these tools cannot change the condition of Iranian agriculture as they rely on human power which is relatively expensive and unproductive.

Man can direct power, however, and increase his output tremendously. He can learn to operate a tractor with 25 to 40 horsepower, thereby increasing his output 250 to 400 times.

Inefficiency of Methods

The total man-hours required for growing rice, for instance, is 1,080 per hectare. The labor cost figured at prevailing rates is Rls. 3,000 per hectare. It can be seen that methods which require so high an input of labor are expensive, and they make it impossible for a man and his family to farm more than a few hectares.

Some oxen, donkeys and mules are used for power, but most of those are small and they are used primarily for plowing. Plowing with the primitive, steel-tipped wooden plow is shallow, only a part of the soil is turned, and a second or third plowing is necessary for some crops.

A few tractors have been imported. They have been used mainly for plowing, which is not the most economical practice since plowing accounts for only a small part of

the total labor requirement. For example, in growing cotton, a total of 2,317 man-hours is required per hectare. Of this amount only 32 are used for plowing. If a tractor reduced this figure to only three hours it would make only a slight reduction in the total labor. The same is true for other crops. It is not economical to have a high investment in machinery which will do only one or two operations in the growing of a crop, leaving other operations to be done with hand labor.

The Iranian farmer has a very low investment in farm equipment. A special village study showed an investment in equipment of only Rls. 467 per farmer, and all pieces were hand tools except a plow for two oxen. The man labor requirement is high for all hand tools, because man is a very inefficient source of power. Current power and labor use and labor costs for growing various crops in Iran are shown in Exhibit C-9.

Seasonal Demands

Most peasants are not busy the year around, but during the rush seasons of seed-bed preparation and harvest, the demand for power and labor is greater than the supply. Wages at harvest time are three to four times higher than normal. The amount of labor needed for the busiest period determines the number of workers who must be available either locally or elsewhere, subject to being brought into an area during such heavy demand periods.

An example from the Veramin Plain illustrates what happens when power and labor are lacking during the wheat-seeding season. During an average year 25 per cent of the crop is seeded early, 50 per cent medium and 25 per cent late. In 1327 (1948) 65 per cent of the crop was seeded late. Local reports show that seeding date affects wheat yields as follows:

	Yield
Early seeded wheat	20-25 times the seed
Medium seeded	15-20 times the seed
Late seeded	8-15 times the seed

This represents a big loss in yield resulting from the slow rate of plowing after the application of water to soften the soil. The Near East Foundation demonstrated that by plowing with a tractor, as compared with oxen, 50 per cent more land could be seeded for a given quantity of water (when the same amount of water was available one day each week in both cases).

INTRODUCTION OF MACHINERY

The introduction of mechanical power and equipment into Iranian agriculture will be accompanied by the following problems, some of which will be difficult to solve:

The demand exceeds the supply of both machinery and foreign exchange.
Both dealers and farmers need credit for machinery purchases.
The dealer service on spare parts and repairs is inadequate.
There is a shortage of trained machinery operators.
Efficient types of machines and their uses must be demonstrated to farmers.
Introduction of machinery into a village economy will be complicated.

The foregoing problems are discussed in the following paragraphs and recommendations for their solutions are made.

Demand for Machinery

At present there is a great demand for farm machinery by landowners, and by companies which are being formed to do large scale farming. In nearly every part of Iran people want tractors and machinery. If financing could be obtained by those without sufficient capital to pay cash for machinery more machinery would be imported. The demand at present exceeds the supply for two reasons: (1) manufacturers have not been able to allot enough equipment to Iran and (2) too little foreign exchange has been made available. The most recent demand for machinery is in the Gurgan Plain where companies are being formed to grow wheat and barley on a large scale. There are approximately 700,000 hectares in this plain available for cultivation. Many tractors brought in 10 to 12 years ago are still operating despite the handicaps of inexperienced service men and lack of spare parts.

The accompanying data indicate the limited numbers of tractors that have been brought into Iran during a recent period and the approximate number still in service:

Year	Number Imported
1305-1309	77
1310-1314	8
1315-1319	327
1320	15
1321	45
1321-1324	None
1325	101
1326	49
Total	622
Approximate number in operation	240

If the well-being of the small farmer is to improve he must be able to farm his present land at less cost and he must be able to farm additional land. Small farmers do not have the means to purchase machinery, nor do they know how to use it, and there is no one at present who can help them. A large per cent of the farmers would welcome a chance to employ machines. In a few cases landlords own tractors and use them to prepare the seedbed for the peasants. In other cases custom operators work for a number of farmers. Since farmers want and need this type of service, it should be possible for them to co-operate, or hire some one to do certain jobs for them at much less cost than at present.

Need for Credit

The importation of large volumes of farm machinery requires a sizable amount of capital. This money may be tied up for as much as five or six months while machinery is en route. Dealers have had to borrow money from sources charging exorbitant rates of interest which has tended to increase the cost of the machines. A central agency is needed where dealers may get short-term low interest loans to cover a large per cent of the cost of the machines until they are sold, probably less than six months later. Many landowners are able to pay for machinery, but small farmers and men who wish to do custom

work for many farmers do not have ready cash. It is necessary that a plan of financing be set up for such cases.

Inadequate Service Facilities

The only machinery dealer service is located in Tehran, and even here the service of many dealers has not been adequate. Farm machinery has been a sideline with too many. Tractor owners have had to go to Tehran for parts or have local shops make them; motors have had to be taken out of tractors and shipped by truck or rail to Tehran for major overhauls. It is essential that local services be established to overcome such handicaps.

Shortage of Trained Operators

The successful use of farm machinery depends to a great extent upon capable, well-trained young men who not only can operate machinery, but who know something about farming so that they can perform a job the way it should be done. The ability to drive a tractor is not enough; each piece of equipment used will require training and experience. Low operating costs for machinery depend upon efficient use and servicing. Training and experience are necessary to attain this objective. Young men must be encouraged and helped to become modern farmers. Public opinion in Iran is against the practice of educated men working with their hands, particularly in agriculture. Such ideas must be changed and modern farming must be established as an accepted profession on the same basis as medicine or law if agriculture is to take its proper place in the national economy.

Demonstration Needed

Since plowing and discing with a standard type tractor with steel wheels are about the only operations the majority of the farmers in Iran have seen, it will be necessary to demonstrate how useful and profitable a tractor can be. For instance growing cotton now requires over 2,300 man-hours per hectare. In the United States under similar conditions it is being done with 312 man-hours. The saving in man-hours is accomplished by having what is called a "balanced unit". One man has a tract of land large enough to be farmed economically with a tractor and a set of machinery which enables him to do practically all of the operations except picking. In many areas in Iran it will not be possible to make efficient use of machinery unless field arrangement and irrigation practices are changed. Where the use of machinery is complicated it will be necessary to proceed slowly and to demonstrate profitable practices under controlled conditions before the machines are recommended for general use.

Problems of Village Economy

When tractors and machinery are brought into a village it will be economical only if more land can be farmed or if labor and animal power are replaced. It is conceivable that a landowner might displace several farmers and oxen by bringing in such equipment. If this be done, and the displaced farmers have no job to go to, it will create a bad economic situation in the early stages of this program before industry or Government create a demand for labor.

Machines should be introduced primarily in areas where dry land farming can be expanded on lands not now in use, or in connection with a village where additional areas can be farmed with present or added water or by dry farming methods.

Since the average peasant now operates only about three hectares, and has no capital, it will be difficult for him to get control of enough land to make the use of a tractor practical. If the landlord owns the tractor then the peasant may be no better off than before. There remains the possibility that machinery may be added with one outfit for each boneh (a group of four to eight peasants who furnish the labor and power for field operations).

RECOMMENDATIONS

Financing

One of the first requirements in solving the farm machinery problem in Iran is to provide adequate financing for dealers and prospective buyers. In order that more farmers may receive the benefit of machinery, it is suggested that a qualified agency be set up to finance it. The agency could have two functions. It could make short-term loans to dealers when necessary to bring machines into the country, and it could make four or five year loans to farmers or custom operators so that they could purchase machines. Machinery financing is fairly complicated under Iranian conditions and loans should be made only to buy machines to be operated under supervision where adequate security is available. The loaning company should retain title until payment is made in full.

Government Control

In general less government control over business rather than more is to be recommended. During the early stages of agricultural mechanization, however, it may be desirable for the government to exercise some control over the allocation of exchange for machinery importation and over retail prices for machines. Therefore we recommend that an agency be set up in the Ministry of Agriculture to perform these functions. This agency should be a part of the organization which supplies credit to machinery dealers, farmers and custom operators.

The Research and Extension Institute should collect information to guide the Ministry in these matters. It should supply data on the following problems: the total amount of foreign exchange which should be made available for the importation of machinery, the areas of the country where the need for machinery is most urgent, the types and sizes of machines suitable for local conditions, and reasonable margins for local dealers. The person in charge of the agricultural engineering section of the Institute should be responsible for rendering this service.

When local dealers are allowed adequate margins to provide repair service, spare parts and to assist in the training of local mechanics they should be willing to operate within these margins. If necessary the Ministry may bring pressure on manufacturers to make sure that dealers follow fair pricing practices. The Government can exercise some control through the allocation of foreign exchange and the issuance of dealers' franchises.

Custom Operators

A custom operator is one who owns a set of farm machinery and does farm work for anyone willing to pay for his services. There are many advantages to this type of service. The operator is responsible for his machinery and keeps it in order. He can give small farmers a service that they need but could not have otherwise because they cannot afford to purchase machinery. A custom operator should become skillful, because he gets extensive experience.

Custom operators with small or medium sized machinery would be very useful in nearly every village. They could reduce the cost of many jobs now done by hand or with oxen. Young men should be given training, experience and financial assistance in obtaining equipment. The establishment of custom operators should be encouraged and it can be done best through the special organization for the importation of machinery.

Local Service Stations

Dealers must be encouraged to establish service stations in areas where machinery is being used. The whole mechanization program depends upon adequate service stations. A complete line of spare parts, a shop equipped with tools suitable for the job, a factory-trained mechanic and an adequate building are necessary. The building need not be expensive but it should be located at the edge of the village where it is accessible to large machines. It should provide good working conditions for the mechanic as well as an orderly storage of parts. Machinery dealers in co-operation with the factory can best provide these services. They will be profitable, in time, after several machines are located in an area.

To make it possible for dealers to provide these services it is suggested that during the first few years the Plan agricultural engineering adviser divide the farming areas so that each dealer can concentrate his machines around a service station. An adequate profit should be allowed on new machines to make such services possible. There are mechanics in nearly every village of any size. Many of these can be trained by factory men to service and overhaul farm machinery. In addition to a mechanic each station should have a manager who takes orders, keeps spare parts in stock and runs the business. Irrigation pumps, parts and service can be handled by the same station.

Demonstration Farms

One of the most effective ways to teach farm people is by demonstration. This is particularly true with methods of farming. Much progress can be made and considerable money saved if means are provided for testing and demonstrating machines under local conditions. The Agricultural Research and Extension Institute is the logical agency to do this. Agricultural engineers in that organization should study all phases of agriculture to find types of machines and methods of production which are best adapted to Iranian conditions. (Note the demonstration projects described later in this section.)

Dry Farm Areas

In areas of low rainfall there are large tracts of land which will grow cereals but which produce low yields per hectare. It is not economical to farm this land with hand methods or with small animal units. One man cannot farm a large enough area to make a living. However, with modern farm equipment it would be possible for one man to farm

many hectares and, while the yield per hectare might be low, the total production per man should be quite high. Such a plan has been recommended for the Gurgan Plain. The same idea can be carried out at Hamadan, Kermanshah Plain, Kazvin and other similar areas.

Rice Production

There is no doubt that rice production costs can be reduced if cultural operations, in some areas at least, can be mechanized. Research studies will be required to ascertain the areas most suitable for mechanized production and the varieties best adapted to those areas, and to determine instructions to be given to growers.

Successful rice mechanization requires: control of the water so that it can be applied or removed from the land at will, direct seeding instead of transplanting, a self-propelled combine, a special cart for taking rice from the combine to the highway, and a rice drying plant. It will be necessary to study these problems and to demonstrate improved practices.

Straw Handling

Modern methods of handling straw must be demonstrated before the small farmers will accept the use of the combine. At present all straw is gathered and used for feed. It is cut close to the ground in order to get all of it. When it is threshed by oxen walking over it, it is crushed. Much of the straw is chopped by hand after it is threshed because it is believed that animals cannot eat long straw. This custom which is thousands of years old is deep-rooted.

A demonstration is needed to show that: combine harvesting costs much less than hand harvesting, more of the grain can be saved by combining, straw can be collected with machinery, straw can be crushed with machinery if necessary, animals can eat long straw as well as short crushed straw. The problem of cutting close to the ground thus removing organic matter needed by the soil should be overcome gradually when larger areas of wheat and barley are raised and straw is more plentiful. Also, a change in cropping practices which produces more alfalfa and other feed for livestock will make straw less necessary for feed.

Agricultural Engineering

Agricultural engineers are interested in three things as they apply to agriculture, namely, power economy, labor efficiency, and materials.

There are four major fields in agricultural engineering:

Farm power and machinery
Farm housing and other structures
Soil and water conservation which includes irrigation, drainage and erosion control
Rural industries

Many men with training in the above fields are needed in Iran to improve agriculture. They are needed in teaching, industry, research and extension and even in private business. Machinery dealers need such men to take charge of their business and service stations.

The College of Agriculture at Karaj should have a strong department staffed with competent personnel to train men for such work. Foreign advisers will be necessary during the period of development.

The department of agricultural engineering should make studies in co-operation with the agricultural economics department to determine the conditions under which wells are practical for irrigation. In co-operation with the ostan stations they should be able to determine the conditions under which machines of various types are to be recommended. Machinery efficiency studies are among others that should be made. A competent staff should gain the confidence of business men and farmers and it can render valuable service to them.

PART TWO—DETAILED PLANS AND PROCEDURES

AGRICULTURAL EDUCATION PROGRAM

The functions of an educational system in any country should be to train people to think independently and to act constructively for the welfare of the citizens. In order to perform well in an educational program at the college level, many factors must be considered. There must be much more than simply a desire for such an institution.

Of first importance is the will on the part of responsible persons to have an educational institution of the highest order. Buildings, a faculty well trained, a student body—these are all essential. Of greater importance is the attitude of the leaders of a nation or a state with respect to how the institution shall function and what financial support shall be given to help it accomplish the desired goals.

It is our proposal, under the Seven Year Plan, that the agricultural education program at the college level be continued as a part of the University of Tehran. We wish to propose, however, that the program in agriculture be expanded in co-operation with the Ministry of Agriculture and the Seven Year Plan to add research and rural extension teaching. Only by developing all three phases can agricultural leadership be trained and the welfare of the rural population be improved.

To accomplish these ends, there should be established agricultural experiment stations to conduct research in major fields of agriculture. Also, there should be an agricultural extension service to carry out to the rural areas the knowledge assembled or developed by the teaching and research programs.

AGRICULTURAL RESEARCH AND EXTENSION INSTITUTE

We recommend that an Agricultural Research and Extension Institute be created in the Plan Organization. The purpose of this Institute will be to conduct the research and extension work so necessary to the improvement of Iranian agriculture. The Institute should be set up in the Plan Organization with the idea that it will be transferred to the appropriate organization at a later date. The Institute must be operated in close co-operation with the Ministry of Agriculture. It must be controlled by the Plan Organization, however, during the first few years to guarantee that the experiments and the related extension work will not be disrupted should there be changes in Government personnel.

An advisory committee of three members is suggested. One should be appointed by the Minister of Agriculture, one by the managing director of the Plan Organization, and one should be a foreign adviser to be appointed by the director of the Institute. This committee should serve in an advisory capacity to the director of the Institute, who will be appointed by the managing director of the Plan Organization. (Exhibit C-10.)

The advisory committee should serve to co-ordinate the activities of the Ministry of Agriculture and the Plan Organization. This is very important in connection with the ostan stations and demonstration farms. The Institute should do considerable research work which will guide the Ministry in its agricultural projects.

The director of the Institute should have two principal assistants; one in charge of research, and one in charge of extension. These men should have under their super-

vision, in the central office, enough specialists to direct the respective fields of work in the various ostans.

It is recommended that enough foreign personnel be employed to guarantee the organization and execution of a scientific research program. The director of the Institute and his two assistants should be foreign experts employed initially for at least two years. The remainder of the staff for the central organization and for the ostan stations should be composed of Iranians in so far as trained and qualified personnel is available. For the first few years of the program it is expected that at least half of the staff must be foreign.

Close co-operation with the Ministry of Agriculture is highly desirable. The Ministry should make available for use as ostan stations or sub-stations such land and other facilities as are now available at these locations. Trained personnel which is available should also be contributed by the Ministry, since it constitutes about the only Iranian source of men with technical training in agriculture. It is anticipated that many special projects to be sponsored in part by Plan funds will be administered directly by the Ministry but in co-operation with the Plan Organization. The plant disease and insect control program, the sanitary inspection of livestock products, the emergency relief and rehabilitation program, the land and water resources service, the seed stocks program, and the regulatory phases of the forestry program are examples of services which should be administered by the Ministry of Agriculture.

Four main departments are suggested for the research and extension activities as shown in the outline: animal science, plant science, agricultural economics, and agricultural engineering and irrigation. We believe that the highest possible degree of co-operation and co-ordination of research in a particular subject matter department can be achieved only when the various research specialists work under a single-department leadership.

Soil science in many phases, for example, must undergird the research and extension work in both agronomy and horticulture. Likewise, the extension and research in both botany and plant pests is of equal interest and importance to the applied fields of plant husbandry, namely, agronomy and horticulture.

For obvious reasons, forest and range work should be set up under the plant science department. Investigations in forestry and ranges will be related directly to problems of soil and water conservation—both of direct interest to the applied phases of agronomy and horticulture. Likewise, that work must be conducted in co-operation with the department of animal science since natural feed supplies and livestock grazing are closely allied. This type of co-operation is of utmost importance since range management is vital to the solution of the problems of the tribes.

In the animal science field, furthermore, from the standpoint of giving warranted emphasis to its various branches, a single department is suggested.

We recommend a separate department of agricultural engineering. The work of such a department will be effective if administered by a man trained thoroughly in agricultural engineering and irrigation techniques. The irrigation phases of its program will be of major interest to both agronomy and horticulture. In any event, there must be a high degree of co-operation between the departments of agricultural engineering and plant science. The technical phases of water use and application are of but little value unless they result in better yields of higher quality plant products from water used efficiently.

Agricultural economics covers another field of study which goes beyond the direct interests or training of the men in production work. The process of bringing together the various factors of production such as capital, land, labor, and management, so as to form an economic unit involves special training usually not available either to animal or plant science personnel. Furthermore, important studies in land ownership, tenure and use; in marketing; and in rural sociology, require special training. The department, as suggested, should contribute much to the overall research and extension program.

A separate department of food technology was considered but not included in the present plant because of the shortage of technical personnel and the desire to keep the organization as simple as possible. Such departments have developed only recently at most foreign institutions. When either the Institute or Karaj College has developed to a point where work of this kind can be supported, a separate department is suggested which would include dairy manufactures, canning and processing of foods, industrial uses of agricultural products and related activities.

It is recommended that the Institute be located in part at least at the research station near Karaj. In this way there can be a close contact between the administrators of the Institute and that portion of the research being done locally. Such a location will also promote co-operation between the Institute and Karaj College.

OSTAN STATIONS

We further recommend that a minimum of four major ostan research and extension stations be organized as soon as possible. One should be located in the Caspian area, one in the hot zone at Ahwaz, one on the plateau at Tabriz, and one near Karaj where the Agricultural College is located. Ostan stations or substations should eventually be started in each ostan. The ostan stations are necessary since soil and climatic conditions vary so widely in different parts of the country that research done at a central station would have but limited application. The organization of the work in both research and extension for the ostans is indicated by Exhibit C-10. The personnel for each station should be determined by the problems in the area. Tea culture, for instance, should be studied at the Caspian station and sugar cane production at the hot zone station.

Substation Experiment Farms

It should be pointed out that, in a country as large as Iran and with such a wide range of plant environments, it will be necessary to have, in due time, several outlying or branch experiment station farms.

Such stations should be located so as to serve the needs of sizeable areas of land, or of special crops confined to specific areas by their environmental requirements, or to work on certain livestock problems peculiar to a definite area.

Land use problems are acute in Iranian agriculture; landlord-peasant relationships and marketing problems must be studied. It is important to discover through accurate farm records the comparative advantage of competing crops in important areas; therefore work in agricultural economics must be included in each station. In like manner, work on farm machinery, farm structures and drainage must be done by a staff trained in agricultural engineering. Usually it will be desirable to have some resident research personnel at the substations. Work done in specific phases, however, should be directed by the heads of the respective departments in the Institute. Each substation, of course, should

have a competent superintendent directly responsible, through the associate director in charge of research, to the director of the Research and Extension Institute.

The substations, in addition to research programs, can serve well as demonstration farms and sources of information for the extension agents. They can play a most important role also in supplying pure stocks of improved planting seed, nursery stock and even animal breeding stock to farmers directly or through co-operative organizations of growers.

AGRICULTURAL EXTENSION SERVICE

In several countries this branch of the agricultural education program has been proved to be most necessary and a very effective means of improving rural conditions and increasing agricultural production. It should serve, as indicated earlier, to bring directly to rural people the information discovered at the various stations and assembled at the Institute.

The success of any extension program is dependent largely upon the quality and calibre of the personnel who carry out the work in the field. All extension specialists should be agricultural college trained men. They should, of course, be individuals having initiative, sound judgment and patience to work out long-term projects which involve customs and practices of long standing.

It is our opinion that there should be an overall organization extending from the national level through the ostans to the shahristans. Only through such a complete set-up can improvement programs with plant and animal management, soil and water conservation, and rural living be taken to the individual farm level. This organization for the extension service should parallel that for the research work.

Demonstration Farms

Iranian agriculture is primitive and practices are well established. Very little change has been made for centuries. The fact that most of the peasants are illiterate will increase the difficulty of doing effective extension work. In view of these conditions it is suggested that much use be made of demonstration farms. These units may be set up by the extension service under the supervision of foreign professional farm managers to show profitable farm units for important problem areas. They should demonstrate profitable combinations of land, labor and capital in the form of water, machines and livestock. It is very important to show how the product per worker may be increased by the use of machinery. This idea is more fully developed in a later section.

Extension Agents

Extension agents should be located at ostan stations and substations, and in addition in important agricultural areas where no research work is being done. It should be the duty of the extension agents to work very closely with the peasants and the tribes. They must be persons with a desire to serve agriculture and who are willing to live and work with rural people. They must have good judgment and a broad training in agriculture. They should be responsible for training local leaders for many types of work and should organize local people and areas for plant pest control, for livestock disease control programs and for other projects of this type.

The extension specialists at the Institute and the specialists at the ostan stations should co-operate to keep the work of the extension agents properly co-ordinated. The extension agents will keep the central organization advised of any special problems requiring emergency measures.

COLLEGE OF AGRICULTURE

We recommend that the Plan Organization co-operate with the University of Tehran to provide for the graduation of approximately 100 men a year from an expanded four-year college course in agriculture. Most of the facilities are now available at Karaj but Plan funds should be used to provide the additional buildings and laboratories needed. Plan funds should be used also to provide an expert staff to train the persons needed in the agricultural research and extension fields and as teachers for the rural teacher training schools as recommended in the education section (Vol. II).

For the first few years of the Plan we recommend that a number of the staff members be foreign, to insure adequate teaching in several fields not now covered and to promote co-operation with the Research and Extension Institute. It is important that the teaching be of a practical nature and that it prepare the students to work with farm problems and rural people. Because the teaching should have a close contact with the research work, we recommend that facilities for field research be made available at the college or in co-operation with the research station to be operated near Karaj by the Institute.

Organization

We recommend that the subject matter organization parallel that for the research and extension work as indicated in Exhibit C-10. In addition to courses in agriculture, it is anticipated that a well-balanced curriculum will be developed to include basic science such as chemistry, botany, entomology, zoology and mathematics, as well as courses in composition, rhetoric and perhaps humanities.

If the reorganized College of Agriculture is to succeed in meeting the needs of Iranian agriculture certain important conditions must be met. Some of these may be listed as follows:

1. There must be constant co-operation between the University of Tehran, the Ministry of Agriculture and the Plan Organization.
2. Administrative responsibilities must be defined clearly and officials held accountable within the scope of their work.
3. Staff members must be chosen carefully on the bases of training, experience and character.
4. There must be a reasonable expectation of continuous tenure on the part of staff members when work is done to the satisfaction of administrators.
5. Salary levels and schedules of increase must be so established as to attract and hold high-class personnel on the basis of full-time employment.
6. High standards of performance must be required of both the staff and the students if the college is to progress.

COLLEGE OF VETERINARY MEDICINE

The present College of Veterinary Medicine has a very large staff for the small number of students. A portion of the staff time, however, should be shifted from teaching to research and laboratory work. Without doubt, the animal industry of Iran is important enough to demand the services of a corps of well-trained veterinarians. Therefore the veterinary college staff should be adjusted to the scale necessary to train the students needed for research, for teaching in the College of Agriculture, for laboratory technician work, and to staff regulatory services proposed under the Plan.

Several of the present veterinary college staff members should be transferred to the College of Agriculture to make up a division of animal pathology. They will be needed to teach the principles and practices of animal disease and parasite control to the students at Karaj.

To accompany the above plan we recommend a change in the program of the veterinary college as follows:

1. Develop a three-year course at the veterinary college.
2. Require that before entrance to the veterinary college students shall have completed two years of basic agricultural training at Karaj.
3. Confine the teaching to semi-technical and technical courses related to veterinary science.

Under no circumstances should the veterinary college teach courses in livestock breeding, feeding or management.

By carrying out the changes recommended above the staff at the veterinary college can be reduced while its efficiency can be increased. Under this arrangement it should be possible to train graduate veterinarians more efficiently and satisfactorily in Iran than to send them abroad. If future demand requires it, of course, the staff at the veterinary college can be increased.

FOREIGN TRAINING

It is a recognized fact that at present in Iran there are not enough men technically trained in agriculture to carry out the details of the proposals being recommended for agricultural development under the Seven Year Plan. The situation was known to the agricultural section of the Provisional Planning Board and certain proposals were made for correcting it. One recommendation was that the college at Karaj be expanded and strengthened so as to graduate more and better-trained students each year. We are in general agreement with that objective.

The training programs at Karaj and at the veterinary college cannot produce immediate results even though they be changed and improved immediately. In the meantime, it should prove highly desirable to use Plan funds to send persons abroad for training as the agricultural section suggested.

We recommend that there be at least two categories for such a program. One would be to make foreign training available to selected graduates of Karaj College. Preferably, those selected should have had some experience in agricultural work since graduation to have proved their abilities and to have given some indication of the special

phases of agriculture into which they might fit. Those men should be sent to a foreign college or university where high-grade training can be secured to fit them for special positions under the Seven Year Plan. They should be sent for periods of from two to four years to earn master's or doctor of philosophy degrees, as dictated by the needs of the positions which they will eventually occupy in Iran.

The second category should be a provision for specialized training for workers now serving as teachers at Karaj, in the veterinary college, or as technical workers in the Ministry of Agriculture. Those individuals should be selected carefully and sent on a leave basis for periods of 12 to 18 months to secure specialized training in their chosen fields of work. While some advanced degrees might be earned by such study, the main objective would be to provide a refresher period in which to learn the most modern research or teaching methods and techniques.

Organization

We recommend that this project be set up as a part of the overall agricultural education program. We recommend further that the program be administered by the suggested advisory committee of the Agricultural Research and Extension Institute. That committee should know at an early date the needs for better-trained personnel throughout the agricultural education program and within the Ministry. Administrative officers in the various organizations and branches should suggest to the advisory committee those persons who would benefit most from the foreign training. Individuals who might be candidates then should make formal application to the committee for the foreign study privilege. Determining qualifications for final selection should be established by the committee.

We recommend that no definite figure be set at this time for either category of study or for any branch of the agricultural program to indicate how many students should be sent abroad in any year or during the Seven Year Plan period. The needs for better-trained workers, the availability of candidates and funds, and the ability to arrange for foreign study should determine actual numbers to be sent abroad.

Funds

It is recommended that Plan funds to the extent of Rls. 5,000,000 annually be set aside with which to carry out this program. Details regarding sums to be paid to students under the different categories should be worked out and the funds administered by the advisory committee or its duly authorized representative within the Plan Organization.

SECONDARY AGRICULTURAL SCHOOL

Plans were presented also by the agricultural section of the Provisional Planning Board for the establishment of secondary agricultural schools at 13 different locations in Iran.

We recognize a great need for such intermediate training in agriculture. We believe, however, that it is unwise at this time to make definite recommendations regarding secondary schools. Eventually there should be a training program for rural youth which will tend to keep them on the land and make them better farmers. At the present time, and during the early years of the Plan, there will not be trained personnel available

to conduct such a program. If and when it is initiated, it should be integrated closely with the program in general education. We recommend, therefore, that the problem be referred to the dean of the agricultural college for study in co-operation with the Ministry of Education.

OSTAN PROJECTS

ENVIRONMENTAL VARIABILITY

The agricultural environment of Iran is variable to a striking degree and this is due to several factors.

Latitude Range

While the country consists of a rather compact land mass, the greatest dimension extends in a northwest-southeast direction covering some 15 degrees of latitude. This situation in itself results in a considerable difference in the length of the growing season. As an example it might be noted that while fall-sown barley was heading out near Bushire in Esfand (March), the fall-sown wheat at Khoy in northern Azarbaijan was still in the tillering or stooling stage on Ordibehesht 11 (May 1) and spring grains were just being sown.

Altitude Differences

In addition to the latitude factor there is a great variation in the altitude at which agriculture is carried on, due to the presence of the mountain chains and broken ranges which extend from almost the extreme south to the extreme northwest and along the Caspian shore in the north. Thus farming and livestock production are carried on from about sea level, along the Persian Gulf and the Caspian, to elevations of 2,500 to 3,000 meters above sea level in the higher mountains. The variation in altitude or elevation influences such factors of the agricultural environment as length of growing season, temperature extremes, yearly precipitation, and sunlight intensity. Those factors, in turn, determine the kinds of crop that can be grown, the periods of the year when natural forage is available for grazing livestock, the period of time for which it is necessary to provide stored or preserved feed for animals and other similar items.

Rainfall

The great variation in rainfall—from almost none to approximately 120 centimeters annually—affects greatly the crops that can be grown and the agricultural practices that must be followed. In some of the southern parts of the country where the winters are very mild, neither winter nor summer crops can be grown without irrigation. Under such conditions the short-growing, winter-annual types of vegetation constitute most of the natural range cover. In other places, having rather similar winter temperatures, small grains can be grown as a dry-farm crop from fall seeding because of somewhat more rainfall well distributed throughout the winter. Under such conditions cultivated summer crops of almost all kinds must be irrigated to produce satisfactory results.

At the higher altitudes in the southern mountains, natural forage persists and remains more or less productive throughout the summer. At the higher altitudes and latitudes of central and northern Iran only the winter-dormant types of herbaceous and woody

agricultural plants can survive the winters, and crop growth, both natural and cultivated, is confined to a period varying from about four and one-half to eight months in length.

In the high rainfall areas of the Caspian most crops, except rice, are grown without irrigation. There, where the winters are mild at the low altitudes, citrus trees and tea can be grown successfully and forage plants remain in a growing condition throughout the winter. On the other hand, in other northern areas where the growing season is short, summer crops may be seriously reduced in yield because of summer drought and inadequate supplies of irrigation water.

Soils

The soils that are farmed are predominantly alluvial and in many respects remarkably uniform. Still, because of great differences in the chemical makeup of the waters used for irrigation, the soils as a home for plants may vary widely. Origin or parent material from which the soils have been formed naturally causes differences in soil type and chemical and physical composition.

Economic Factors

Transportation facilities, distances to market centers, tariff regulations and governmental pricing policies are economic factors which have an influence on the relative profitableness of crop and livestock products. Bulky and perishable products have an advantage near consuming centers, whereas products having a high value per unit of weight can be transported greater distances. The prices of several important agricultural products such as sugar, wheat and tobacco are controlled in whole or in part by the Government and the level at which prices are fixed has an important bearing on the acreage of crops planted by farmers. The supply of labor and equipment also are factors having a bearing on this important problem.

OSTAN STATIONS

It is evident that, because of the foregoing variations, experimental work with crops of all kinds and with livestock must be carried on at several locations in order to solve the problems which occur under the different conditions. As indicated previously, we recommend that four ostan stations be organized as soon as possible and that stations eventually be established in all ostans. For the same season 13 substations and 28 demonstration farms are recommended. (Exhibit C-11)

The general organization and administration of all ostan stations will be similar, but no two will be alike with respect to personnel and the type of problems to be studied. Sugar cane, dates, citrus, alfalfa and other forages are crops which will receive special consideration in Khuzistan. The culture of tea, silk, tobacco, rice and citrus will be studied in the Caspian area. Fruit production, processing and marketing will be featured in Azarbaijan and Khorassan. Cotton, citrus, olives and flax will receive special consideration in Fars. Cotton studies should be stressed at Karaj, Veramin and Kermanshah. Cereal production, forages, forestry and livestock will be included in practically all stations.

It is expected that the budgets for the minor ostan stations will be about sixty per cent as large as for the major stations.

Ahwaz Station

The following is a description of the research and extension station proposed for the hot zone. Ahwaz is recommended as an ideal location for this major station and the following factors favor this selection.

In one respect the station at Ahwaz will not be typical of other major stations since it is recommended that the livestock research be located at Ahu-Dasht, in the northern part of the province where it will be near the flocks of some of the tribes.

The land, the water, and the climatic conditions are typical of most of the coastal plain area which extends from northwest of Dizful to at least Bushire in Ostan 7. Because of the long growing season and the plentiful supply of water (if developed), a wide variety of crops can be grown throughout the year.

A large tract of some 1,000 hectares of land is already available, under the supervision of the Ministry of Agriculture. Irrigation canals are installed and water enough for several hundred hectares is being delivered to them by direct pumping from the year-round flow of the Karun River. By installing additional pumps the land area in crops can be increased several fold.

Some buildings which could be used in a station program are available now. The headquarters and the land are near the city of Ahwaz, an important fact from the standpoint both of using the farm in agricultural extension teaching and of securing labor, supplies and repairs. We recommend that these facilities and personnel be made available to the Institute to be operated in co-operation with the Ministry of Agriculture.

There is, of course, a great need for research information in agriculture if the economy of the area is to be improved. Much must be learned about crop and varietal adaptation, cultural methods, irrigation practices, plant cover and erosion conditions on the watersheds, tillage operations, and the use or disposition of the crops which may be grown.

By a wise development of the natural resources of this large area much can be done to improve the relationships between the tribal people and the rural and urban settlements. Research and demonstration in animal science and range management will be conducted in areas which the tribes use for winter pasture.

Objectives

Research in connection with the production and marketing of agronomic and horticultural crops will constitute an important part of the program. Special emphasis will be given to the use of farm machinery, the placing of Government lands in the hands of peasants, and the expanded use of water. The following are typical of the objectives to be attained:

1. To determine the adaptability of sugar cane, sugar beets, citrus, flax, cotton, alfalfa, and vegetables of various kinds to the area.
2. To discover which of the present varieties of various crops are best suited to the area.
3. To improve crop yields and quality through selection and breeding.
4. To establish the best dates, rates, and methods of planting the various crops.

5. To demonstrate tillage and cultivation practices that are most effective and best suited to the existing soil conditions.
6. To discover irrigation methods, rates and schedules, that should be used for the various crops.
7. To investigate the condition of the watersheds to determine the amount of silt being carried, and the modifications in grazing management needed to stabilize stream flow.
8. To discover methods and practices which will solve soil salt and drainage problems. Attention should be given to selecting alkali resistant kinds and varieties of plants.
9. To investigate the possibilities for increasing crop yields through use of fertilizers.
10. To develop methods for controlling plants diseases, insects, and weeds.
11. To work out cropping systems that will be most profitable.
12. To develop improved marketing practices and facilities for important crops with the production, packing and marketing of dates receiving special consideration.

Another important function of the Ahwaz station should be to increase stocks of improved seeds and plants for distribution to farmers. This work might be carried on under the supervision of the local agricultural extension service.

Personnel

The station at Ahwaz should be administered by the director of the Research and Extension Institute but there also must be a local station superintendent to supervise and carry out the research and extension programs under the guidance of the associate directors of the Institute. Work on specific problems should be done by trained investigators who will conduct a program co-operatively with, but under the direction of, the respective department heads at the Institute. The need being urgent and of wide scope, there should be a sizeable staff of resident research workers.

The superintendent of the station should be foreign for at least the first few years as should certain other key staff men. In general, positions should be filled with Iranians to the extent that well-trained, qualified men are available. Personnel should be provided for the following lines of work at the Ahwaz station: field crops, horticultural crops, plant breeding, soils and irrigation, forests and ranges, entomology, plant pathology, agricultural engineering and agricultural economics. In addition, extension specialists should be available for work with field crops, horticultural crops, soils and irrigation, and farm management and marketing.

In addition to the above staff workers, several technical assistants and field laborers will also be needed and clerical and stenographic help must be provided to keep the records, file reports and type letters.

Buildings

A fairly complete program for crop improvement, insect and disease control, soil improvement, irrigation studies, and farm management and marketing research will require the following additional buildings: houses for the farm foreman and the super-

visor of the pumping plant; an office and laboratory building for a staff of 25 technicians plus clerical help; a garage for cars and trucks; machinery and repair shop; a seed cleaning and storage building; a guest house for six to eight visiting staff members.

Housing for resident staff members should be secured in the city of Ahwaz with a rental allowance to be provided in addition to salaries.

Equipment

The chief items of equipment will consist of laboratory apparatus, farm machinery, and new pumping equipment. The farm machinery should be adequate to do all operations of plowing, planting, and cultivating and for the harvesting of at least the small grain and hay crops.

OSTAN SUBSTATIONS

To supplement the research and extension activities of the ostan stations, we recommend 13 substations. The substations are designed to do research on an enterprise peculiar to an area, or to carry on research work of a general nature in important agricultural areas not served by the ostan stations. With the poor transportation facilities of Iran it is important to have many different points of contact with rural people.

At least one substation is recommended for each ostan except Ostan 1 where the station now at Veramin will adequately supplement the main station near Karaj.

We recommend two substations for the Caspian area, one at Lahijan and one at Zirab which should be a forest and range station. Ostans 3 and 4 should be served by substations at Maragheh, Rezaiyeh, Sarab and Mahabad. Other substations are recommended for Kermanshah, Ahu-Dasht, Shabankareh, Chahbahar, Zabol, Birjand and Yezd. The substation at Ahu-Dasht will be described in some detail as an example of the type of organization recommended for the other substations.

Substation at Ahu-Dasht

We recommend that this substation be located on the railroad about 70 kilometers north of Ahwaz in the center of a vast plain near Ahu-Dasht. It would serve as the livestock experiment station dealing with the problems which involve the livestock of the Bakhtiari and Lurs tribes. These problems should include disease and parasite control, the production and use of forage crops, the development of silage and hay for winter feeding, and the selection and improvement of the native types of livestock. Improved practices would include programs for breeding, feeding, and management of livestock as well as clipping, grading and sorting of fleeces to furnish wools adapted to fabric as well as to carpet manufacture.

Approximately 3,000 hectares of irrigated land and 2,000 hectares of dry farming land along with buildings and improvements are now controlled by the Ministry of Agriculture and these facilities should be made available to the Institute.

The following land use program is suggested for the experimental unit, for the first year of the program. As information is collected relative to the productive capacity of the land, changes will probably need to be made. That portion of the Government land

not used for experimental purposes should be rented to tenants who will be given sufficient supervision to influence them to introduce practices which prove to be profitable on the research unit.

Land Use Irrigated Land	Hectares
Cereals	50
Forage crops (hay)	50
Sorghum for silage	10
Summer crops	25
Woodlot and fruits	15
Total irrigated	150
Dry Land	
Cereals	50
Total	200

The following livestock is recommended at the beginning of the period:

Kind of Livestock	Number
Dairy cows	20
Dry cows and young stock	30
Sheep	500
Milk goats	20
Chickens	300

There should be a surplus of hay, pasture and silage for sale to tribesmen who winter their livestock in the valley.

Objectives

This substation would study the problems affecting the Bakhtiari and Lurs tribes, particularly the production of additional forage for their livestock in the summer months. If summer forage can be provided, some of the tribesmen may be induced to forsake their nomadic habits, remain in the lower country, and change over to a livestock and crop system.

This problem involves the availability and use of water during the summer months, when the vegetation normally dries up. As indicated earlier, water is available at Ahu-Dasht to irrigate about 3,000 hectares.

The development of shelter belts and shade for livestock is important and the part which trees and sheds play in livestock production should be studied. Possibly shelter belts supplemented by straw-roofed sheds would answer the problem of shade for animals. Types of economical sheds for dairy cows as well as other livestock should be studied. A good dairy barn and a separate building for processing dairy products should be provided.

If the water table is low enough a trench silo should be made, otherwise a silo should be provided above ground.

The livestock including chickens should be carefully selected and surplus breeding stock made available to the tribesmen. Performance records should be kept on all classes of livestock.

Some surplus feed such as hay, grain and silage should be kept over each year so as to have feed for any emergency, since more feed will be produced than is needed for the livestock. The supervisor may obtain more livestock or sell pasture and feed. The latter method is recommended in connection with a policy of inducing the tribes to produce more forage.

Personnel

Our recommendations for personnel include a superintendent (foreign) and an Iranian specialist and a foreign advisor each for animal production, forage crops, and dairy production. Three assistants and six laborers are also indicated. The superintendent should be responsible directly to the director of the Research and Extension Institute. This arrangement is not typical of other substations as it should be the usual practice to make the supervisor of a substation responsible to the superintendent of the ostan station. The exception is made in this case because here the crops work is at one location and the livestock research at another.

Buildings

Livestock shelter, grain and machinery storage and a creamery should be added to the buildings now available at Ahu-Dasht.

DEMONSTRATION FARMS

Demonstration farms, as previously indicated, should be of many types and serve different purposes. They should prove one of the more effective devices for convincing peasants that their level of living can be increased through the use of new farming practices.

We recommend demonstration farms for the following locations:

Ostan	Approximate Location of Demonstration Farms
1	Resht, Kazvin, West of Karaj, and Kashan
2	Gurgan and Amul
3 and 4	Mianeh, Ardebil and Moghan Plain
5	Hamadan, Kermanshah, Gulan and Burujird
6	Hamidieh, Aquili and Andimishk
7	Fassa, Chahar-Dongeh and Kur River Valley
8	Kerman, Jiroft and Khash
9	Quchan, Qadamgah, Sarakhs and Gunabad
10	Isfahan and Taft

The demonstration farms have been classified and described by types as follows:

Type A—Farms designed to establish peasants, with mechanized equipment, on government lands in areas where cereals and forage can be produced without irrigation.

Type B—Projects which show how machinery can be added to the village economy where cereals and forage can be produced without irrigation. Unused land adjacent to those villages must be available for such projects.

Type C—Projects which show how peasants can be established on Government lands where both water and machines are added.

Type D—Farms designed to show how both machinery and additional water can be added to a village economy where land is available for the required expansion.

Type E—Projects to demonstrate good land use and plant cover improvement on an entire watershed.

Type F—Special projects to demonstrate efficient forage and livestock production and marketing practices.

Type G—Livestock projects to demonstrate production and use of superior breeding stock.

Type H—A project to demonstrate the production and distribution of seed of forage plants useful for hay and grazing.

Type I—A project to demonstrate the production of rice and forage with mechanization.

Detailed plans were developed for each demonstration farm, as a basis for allocating funds, but in the following section only one of each type will be described in detail.

Type A—Gurgan

Purpose

The demonstration farm at Gurgan is designed to show how land, labor and machinery can be applied to a large non-irrigated area to increase the production per worker and the welfare of the peasants. Rainfall on the Gurgan Plain averages about 60 centimeters per year and wheat and forage can be produced without irrigation. Wheat yields, with only fair practices, average 1000 kilograms per hectare. About 700,000 hectares, half of which is Government land, are available for expanding crop production in this area.

Recommendations

We propose that Plan funds be made available to establish peasants on Government land. These peasants should be selected by the professional farm manager who will be hired to manage the project. A portion of the crop will be collected each year to retire the loans made to the peasants for buildings, machinery and for operating expenses the first year.

Organization

Sixteen farm units should be established, with each peasant provided with 120 hectares of land, a set of buildings, and necessary machinery. Livestock should be incorporated in the plan to use the forage produced on the unit and additional grazing lands

available. Government funds should be loaned to the peasants for buildings and the purchase of machinery. The initial seed supply should be advanced by the Government, but after the first year seed will be furnished by the peasants. The Government should receive 20 per cent of the grain and hay to retire the loan on the buildings, but no payment should be collected for pasture. The peasants should furnish labor, seed, power and machinery and all the livestock. Their share of the income would be 80 per cent. A sum should be collected from the peasant's share each year sufficient to repay the value of the machinery in five years. A peasant who successfully operates a tract of land long enough so that the landlord's share (20 per cent) equals the cost of improvements on the land, should be given title to it.

On some of the units it may be desirable to have a livestock share lease with the Government owning half of the livestock and sharing in the income. That would provide a better opportunity to introduce new and improved livestock practices than with a crop share lease.

Each unit should be organized on a basis which will provide the maximum net income per unit. That would require a cropping system which will produce largely grains and forage. Wheat, barley and flax are suggested, with considerable area in alfalfa and perennial grasses. A rotation should be established for each unit to include 60 to 80 hectares of grain crop.

Machinery

A three-plow tractor should be provided for each unit and a combine for each two units. A modern method of hay harvest should be used, which might be by baling or chopping. One machine of the selected type should be available, on a custom basis, for all 16 units.

Buildings

A separate farmstead should be provided for each farm, but the farms should be laid out so that the farmsteads are grouped in units of four located at the adjoining corners of the four farms. This arrangement, which is not the most efficient from the standpoint of labor use, is suggested since one well will serve four families and because it may be desirable to make the transfer from the village economy gradually. Each farmstead should be fenced with the cheapest materials available in the area, but the remainder of the farm should be open. Livestock should be pastured under the supervision of shepherds who may care for the flocks of several peasants (probably four when grazed on the units but in larger flocks when taken to distant grazing areas).

Buildings should be of an economical type for the farm family, the grain and hay, machinery and livestock. Open type sheds can be used for the livestock. Space should be provided for gardens and trees so that the surroundings may be made attractive. One well would provide safe water for each group of four families and their livestock. Toilet facilities should be provided for each family.

Livestock

Sheep, cattle and horses should be added in numbers to use the hay produced on the farm (70-90 tons), the pasture available on the unit, and in addition some pasture which may be available on unused government land surrounding the unit. The possibility

of producing horses, hay and straw for the army should be given consideration as these items are currently in short supply. Special attention must be given to the efficient production and marketing of livestock as this enterprise is not now on an efficient basis in this area. Almost half the livestock starved to death during the unusual cold of the past winter.

Experimental Unit

Approximately 100 hectares of land, adjacent to the farm units, should be used as a station for research work on crops. This unit should be supervised by the Shahi station and used for experiments on rotations, varieties, date of planting, insect control, use of fertilizer and to solve other problems encountered in the operation of the units. An area, fenced for the production of trees may be used by the peasants for fuel and timbers.

Personnel

Personnel for the experimental units, except for a superintendent, should be supplied from the Shahi station. A professional farm manager (foreign) should be employed to supervise the operations on the 16 units. He should secure desirable peasants for each unit, determine the land use programs, supervise the selection of seed, provide for insect and disease control, and work with the peasants on livestock problems including the selection of breeding stock.

A competent agricultural engineer should also be employed to be responsible for the maintenance of all machines until they are paid for by the peasants. He should train machine operators, supervise the conditions under which the machines are operated, assist with minor repairs and make sure that spare parts and repair service are provided by the local dealer.

Financial Returns

The capital input in buildings must be held to a level that can be paid for by the returns from the farm. This project will have failed unless it demonstrates systems of farming which can be duplicated by private capital. Machines must be utilized in such a way that they will contribute to a large production per worker. Each unit must be balanced with the proper amounts of land, machinery, livestock and buildings associated with the labor of one family or one family plus a hired worker where boys are not available to help.

If properly organized, the lands on the Gurgan Plain can add much to the agricultural production of the nation and can develop a system whereby the peasants can have an improved level of living.

The area beyond the demonstration unit can be developed further by the government if the initial venture is successful, but it is recommended that expansion be made by private capital under the leasing arrangements recommended for the units. Credit will be necessary to enable peasants to get started on a satisfactory basis.

Accurate records must be kept by the farm manager to show land use, crop production, livestock production, and income and expenses for each unit. Peasants should co-operate in keeping records for the entire unit.

Type B—Kazvin

The area near Kazvin has an elevation of about 1,300 meters and an average annual rainfall of 30 to 40 centimeters. In this section is grown considerable wheat with dry farming methods, aided in some instances by the use of flood waters. Fruits and nuts are also grown with similar treatment. Kanats are used to provide summer water for most villages, but the quantity is not sufficient to irrigate a very large percentage of the good land available. The summer water is used primarily for peas, beans, alfalfa and melons. Most villages have large numbers of livestock which are grazed most of the year but get a little hay and straw in winter.

Purpose

The demonstration is designed to show how machinery can be added to the village economy with dry land farming, to increase the agricultural production per worker and the level of living of the peasants. In an area where dry farming can be made profitable with mechanized equipment, and where additional land is available near a village, a given labor supply can cultivate a greatly increased area of land.

Recommendations

An agreement should be signed with a landlord who is willing to co-operate in a demonstration to increase the well-being of the peasants of his village.

Organization

The following is a description of a typical village south and east of Kazvin where the demonstration should be located:

There are 3,600 hectares of good land in the village.

One kanat furnishes enough water for 40 hectares of land.

Three hundred hectares are irrigated in part by flood waters.

About 280 hectares of cereals are grown by dry farming.

The village has 3,000 sheep and goats and 250 cows and oxen.

The peasants are organized into 20 boneh with 8 farmers and 8 oxen in each boneh.

The peasants furnish labor and power and get 50 per cent of the crop, except for orchards from which they get two thirds.

Wheat yields on dry land farming range from 600 to 1,500 kilos per hectare.

Plan funds should be loaned for the purchase of tractors and combines so that the area worked by each boneh could be increased from 31 hectares to 100 hectares, of which 10 hectares would supply drought resistant grass for pasturage. As no additional water would be supplied, the increased area, except for the 10 hectares of grass, should be planted to wheat. It is likely also that alfalfa will grow without irrigation water, producing one light hay crop and some pasturage after the hay is removed. The area farmed by the village can be increased from 620 hectares to 2,000 hectares. There will remain 1,600 hectares of fallow. One three-plow tractor should be provided for each boneh and a ten-foot combine for each two boneh. One pick-up baler should be provided for the

village, to pick up the straw behind the combines. Two boneh should be mechanized the first year and four additional ones each year until the village is completely mechanized. Village boys and young men should be trained as machine operators and mechanics. A supply of spare parts should be arranged through a dealer at Kazvin or Tehran.

Machinery

A set of machinery for plowing, seedbed preparation, seeding and harvesting should be provided for each boneh. The machinery should be owned by the peasants, but be secured by the landlord until paid for. The peasants should receive 70 to 80 per cent of the dry land crop if they furnish the seed. They should pay to the government each year for five years 20 per cent of the capital cost of the machinery. The peasants should also bear the machinery operating expenses.

Personnel

A farm manager should supervise this project and one other near by. He should be responsible to the director of the Research and Extension Institute. A well-trained mechanic should be responsible for the operation and maintenance of machinery.

Advantages

The following are advantages of the new plan over the old:

The area worked by each peasant can be increased threefold.

The average yield of dry land wheat can be increased more than 50 per cent by use of machinery to prepare a better seed bed, plant on time, and conserve moisture.

Improved varieties can be used, insects and diseases controlled and losses at harvest time reduced.

Improved practices in livestock production should be introduced.

Sanitary conditions in the village may be improved by providing toilets, use of pure water, and the reduction of flies and mosquitoes.

The children should have improved schools including some training in agriculture.

Type C—Hamidieh

The agricultural society of Khuzistan is now operating a portion of a 7,000 hectare tract of land on the Karkheh River under the supervision of the Ministry of Finance. This area is irrigated by pumps. This unit should be transferred to the Research and Extension Institute and operated under the supervision of the Seven Year Plan. The superintendent of the unit should be responsible to the director of the ostan station at Ahwaz.

Purpose

The unit should be divided into two parts, one part to be devoted to simple crop experiments, and the other to the settlement of selected peasants on Government lands with funds advanced on a loan basis.

Part one of the unit should be used to conduct experiments on variety tests, time of planting, use of fertilizers and use of water (with emphasis on the control of salt). It can be used as a place to reproduce new varieties developed at the Ahwaz station and to demonstrate efficient methods of using, and maintaining farm machinery.

The primary purpose for the land settlement section of the unit should be to demonstrate a system or systems for placing the potential crop lands of Khuzistan in the hands of peasants under circumstances that will provide for a good level of living for the farm families. These units must be organized to provide a proper balance between land, water, labor and machinery.

Recommendations—Experimental Unit

Five hundred hectares of land should be reserved near the pumping plant for producing seeds and for simple crop experiments of a demonstrational nature. This land should be operated with hired labor. The pumping plant should be supervised by the project manager. The machinery repair shop now in operation should be better equipped and used to repair the machines for the demonstration unit. In addition it may be used as a center for the repair and maintenance of the machinery belonging to the peasants. A suitable arrangement should be made through a local dealer for the supply of spare parts.

Recommendations—Family Units

The portion of the area not used for the demonstration farm should be laid out in suitable units and operated by peasants. Credit may be made available for the purchase of the right kinds and amounts of machinery for each family. This process is now under way and eight families are now housed on the demonstration unit. These families have capital for the purchase of machinery and have already started the production of citrus trees. They will furnish an example and inspiration for other families.

Additional peasants should be added in groups of four to six with their homes in clusters as near to their land as possible but located on ground high enough to be well drained and as near to a road as possible.

This level, low-lying farm land suitable for irrigation, has adjacent to it other areas of higher sandy land on which may be located part of the farmsteads. The problem of transportation is an important one and an improved road must be constructed from the pumping plant to the main highway. Farmsteads should be located along this road. We recommend that ten five-family units be established to use a total of approximately 5,000 hectares of land.

Organization

Approximately 100 hectares should be made available for each family. Wheat, barley, flax, cotton, sorghum and alfalfa are crops to be worked into the main rotation. Winter vegetables should be added and sugar cane production may be introduced at a later, but not too distant, date. Citrus and date trees should be started around the farmsteads. Only enough livestock should be added to supply meat, eggs, milk and butter for home consumption. Forage and winter grazing of cereal grains may be sold to the tribes

who use the valley for winter range. The production of the surplus feed may contribute to the solution of the problem of the tribes.

Buildings should be supplied at Government expense and funds advanced for the purchase of machinery. Initial seed supplies should be furnished but after the first year contributed by the peasants.

The Government should receive 40 per cent of the crops to pay for the use of water and buildings. The peasants should furnish labor, seed and machinery and receive 60 per cent of the crop. The peasant should pay, in addition to the 40 per cent for use of land and water, enough to repay the loan on the machinery in about five years. That portion of the 40 per cent of the crop rental which is not needed to pay for the water may be credited against the value of the buildings and, when this value has been repaid, title to the land should be given the peasants. These percentages must be changed if experience based on accurate records indicates that the returns are not in proportion to the contributions of the two parties.

Machinery

A two-plow tractor with cultivating machinery should be supplied for each unit and a combine for each group of five families. Three large tractors with disc plows and three large combines should be provided on a custom basis by the experimental unit.

Buildings

A separate farmstead should be provided for each family, but they should be grouped in units of four to six. Housing of the most economical type (probably adobe construction) should be provided for the farm family, the grain, machinery and livestock. One well, to furnish water for the families and the livestock, should be dug for each group of farmsteads. The housing for livestock should be inexpensive since the winters are mild, and only enough livestock to supply products for home use should be included in first plans. The area may later develop as a livestock feeding center when grain and hay become more abundant.

Personnel

Personnel for research work should be furnished from the Ahwaz station. A farm superintendent (foreign) should be in charge of the project with one Iranian and one foreign assistant. One Iranian engineer should be in charge of the pumping plant, the farm machinery and the training of mechanics and machine operations. He should supervise the use of the custom machines. The foreign assistant, a professional farm manager, should be responsible for the development of the family units. He should secure desirable tenants, supervise cultivation practices, machine use and the collection of rents.

Benefits from the Project

If peasants can be located on a suitable area of productive land, with necessary water and machines, the product per worker should be large and the level of living of the peasant families satisfactory. They may live in comfortable homes, be healthy and educate their children. If the proposed project is successful, incomes must be large enough to pay for the buildings and the machinery; therefore capital inputs for these items should

be held to the minimum for the first years of the plan. When the success of the plan is demonstrated, private capital can be interested in expanding the idea on similar lands in the Ostan. It is important that the idea of putting some of the land in the hands of farm families be thoroughly demonstrated. Since much of the land in Khuzistan must be developed in rather large irrigation districts, the tendency will be for these lands to be owned by men with considerable capital and to be operated with hired labor or by the village economy. The proposed demonstration should show the advantage of family-sized units and family ownership.

It may also guide large land owners in setting up units of economic size.

Type D—Kur River Valley

The Kur River Valley is one of the most promising areas of land in Iran on which to expand agricultural production. The soils are level, deep and fertile. The rainfall unfortunately is less than 40 centimeters, barely sufficient for the production of wheat with dry land methods. The Kur River, however, provides a considerable supply of water much of which is not now being used. Additional water may be supplied in the future by a large storage dam, but in the meantime the available water supply should be used more efficiently.

Purpose

A demonstration unit is suggested to show how water, land, machinery and labor can be combined into efficient units to increase the agricultural production for peasants. One section should be developed in an area where no villages are now located but where water can be supplied from wells, and one should include the village economy where water is supplied by canals from the Kur River. Here practices may be introduced to increase the area which can be irrigated by the water now available. These two demonstrations can serve to set the pattern of land use, size of unit, cultural practices and machinery use on the areas where additional water is made available from storage dams which may be constructed in the future. The venture should also serve to show landlord-peasant relationships which may be copied on other land in the valley.

Recommendations

Unit Where Water is Supplied by Pumping

An area of 600 hectares should be procured, on a long-term lease for cash, in such a location that water can be supplied by pumping from wells or from the river. This unit should be located in the Pulvar River Valley between the sugar beet factory at Pul-i-Khan and Persepolis. This area should be near to additional land that can be used for grazing. On this land, four peasant families should be located so that each has 40 hectares of irrigated land, plus 110 hectares of land for dry farming crops and fallow. Livestock may be grazed on unused lands outside the unit. If well water is proved plentiful, a 12-inch well should be supplied for each peasant family. Suitable buildings and credit for adequate machinery should be supplied. Livestock to use the available forage and pasture may be furnished by the peasants.

Sugar beets, cotton, alfalfa, sorghums, wheat and barley are recommended for the irrigated land with sufficient area reserved for the production of fruits, nuts, fuel and vegetables for home use. Wheat and barley may be grown on the non-irrigated areas.

One two-plow tractor with plows and cultivating machinery should be supplied for each peasant. Two six-foot combines will serve all four farms.

The buildings should be comfortable and sanitary; the surroundings should be made pleasant by plantings, but the capital input held to the minimum consistent with providing a satisfactory level of living for the peasant families and adequate shelter for crops, machinery and livestock.

Forty per cent of the crop should be collected to pay for water and buildings, and 60 per cent will go to the peasants, out of which they should pay for the machinery over a period of five years. At the termination of the lease with the landlord, he should pay for that portion of the cost of buildings, pumping machinery and wells not covered by depreciation at the rate of ten per cent a year.

Unit Where Water is Available

An agreement should be executed with a landlord who is willing to make an effort to improve the level of living of the peasants in his village by adding machinery and expanding the hectarage worked by them. He must agree to be responsible for the machinery supplied to tenants until it is paid for. The village should be located near an area of land available to the peasants for dry land farming so that the land worked per family can be expanded when machinery is added. The irrigated area may also be increased by using the available water to better advantage in the following ways:

Larger areas can be cultivated with a given quantity of water if the land is plowed with tractors instead of animals.

Water can be supplied in proper amounts and at proper intervals.

Winter water can be used to better advantage.

It may also be possible to supply additional water to the village.

A tractor should be supplied for each 80 hectares of land, and a small combine for each 50 hectares of grain to be harvested. The tractors and machinery should be assigned to and paid for by farmers of a boneh working cooperatively. The budgets are based on the assumption that there will be at least five tractors and combines used.

Further increases in efficiency can be gained through an increase in the percentage of most profitable crops, better crop yields, and the prevention of loss during harvesting and storage. The peasants should furnish power, labor and seed, and should therefore be entitled to at least 60 per cent of the crop.

Personnel

A professional farm manager (foreign) should have charge of both units. He should have two Iranian assistants who are trained in agricultural engineering.

Housing and Equipment

Five houses will be required, one for the manager and one for each of the peasant families on new land. Shelter should also be provided for machinery, livestock and grain. Four wells with motors should be required. Each farm family and each village boneh should be provided with a complete set of mechanized equipment.

Type E—Demonstration Watershed

Plant cover of the mountain brush and desert shrub type has been almost completely removed from wide areas of Iran. As a result, surface run-off is excessive and erosion is a menace. Soil is blown on to cultivated land and in several provinces over a wide area sands are moving over kanats and irrigated fields. Foothill drainages produce chronically high spring run-off, and flash floods after rainstorms are common. In the foothills and valley edges with long gently sloping alluvial fans, much less of the precipitation water is being added to the ground water supply than would occur if the area had a good plant cover. Surface floods run largely into the bottoms where the salt-impregnated soils make them useless for irrigation. The age-old terraced slope farming system, ordinarily successful on hill land, is often broken through or covered over with erosion debris from heavy storms.

Recommendations

As a first step in a program to correct these conditions we recommend an experimental demonstration watershed.

An entire drainage basin in the dry region should be selected and put under control in order to restore and protect the natural or suitable plant cover. The area should extend from the top of the watershed to the valley bottom and include all tributary streams, both permanent and temporary. The area should be large enough to make it a fair sample of watershed land that collects flood run-off, both by permanent streams and temporary ones and, if possible, some tree forest, brush and desert plant cover types should be included. The primary object to be accomplished is to demonstrate that the restoration of plant cover will lessen flood run-off, soil loss and erosion by water, largely prevent damaging wind erosion, rebuild soil fertility and provide more stability for agriculture. Within the demonstration area it is highly desirable that farm forestry be introduced to local communities as generally as possible to supply poles, supports, rafters, tool handles and fuel.

Organization

The area should be organized as a unit and administered by a project manager. The manager must be acceptable to the director of the forest service and to the director of the Agricultural Research and Extension Institute. This could be arranged in one of two ways, preference being indicated by the order in which they are presented below:

1. The manager will be chosen by the director of the forest service and approved by the director of the Institute. When the manager has prepared a working plan for the project suitable to the forest service it should be submitted to the director of the Institute. When approved, the plans would be put in operation by the manager under forest service direction.

2. The manager will be chosen by the director of the Research and Extension Institute and approved by the director of the forest service. When the manager has prepared working plans suitable to the director of the Institute they should be submitted to the forest service for approval, after which they would be put in operation under the supervision of the director of the Institute.

The area of the project should be not less than 30 to 40 kilometers long by an average of from 10 to 12 kilometers wide. A smaller area would not be so economical to administer. It should be under the control of a project manager who would have as an assistant a senior ranger to be in charge of four rangers each of whom would be in charge of four guards. Each ranger should be responsible for management of one-fourth of the area. Each guard would have under his administration 16 to 25 square kilometers of land area.

The area should be declared by the Minister of Agriculture to be a public reserve and should be put under control. The experimental plots, the tree plantations, and special areas should be fenced with a net wire fence. About five to ten kilometers of fence should be built on the boundary so located as to close the main paths and livestock trails. Drift fences and patrolling by guards should be used to prevent trespass by prohibited livestock. The fences should be maintained by the guard in whose district they are located.

The area should also have assigned to it four technicians who would work under the immediate supervision of the project manager. The technicians should establish a series of data stations in three or more elevational zones. They should make a record of the kind, size and amount of vegetation on a series of permanent sample plots in each elevational zone. Soil would also be studied as to depth, quality, degree of disturbance, amount of erosion and its relationship to water movement. The plant and soils ecology would also be studied and an attempt made to establish natural plant cover. The permanent streams should be measured and the natural fluctuations in their annual flow established. Records also should be kept of flow in temporary drainage. The importance of this work to the locality and the nation should be studied and presented by an extension specialist of excellent experience and training, who should organize the publicity program through such mediums as the newspaper and radio, and keep before the public the findings and consequences of the experimental demonstration here conducted. Field day visits to the study areas should be conducted at intervals. The extension specialist would have for a long-time objective the job of convincing the people of Iran, and particularly the Government, that destruction of plant cover must be halted, that it can and must be restored by practicable methods, and that this may prove a key to agricultural revival.

On the ground, the research technicans and extension specialists should be responsible to the project manager who would be charged with responsibility for the whole project.

Livestock grazing on the area should be restricted to bring about the restoration and maintenance of the plant cover. Decision as to extent of grazing to be allowed must rest with the project manager, guided by the technicians. On badly-damaged areas grazing should be eliminated for a time and on all areas grazing should be controlled at a level not destructive of the plant cover. Removal of small plant cover for fuel should be eliminated. It may prove to be necessary to remove all livestock now grazing the area and purchase enough of them to stock it with Government-owned livestock.

As soon as this project has shown successful results, others should be started, preferably in areas accessible to large centers of population. It would be very desirable on larger drainage basins to make agreements with private landowners, village people and other users of land to permit their holdings to become part of such a land-use conservation district. This is the one really promising method of accomplishing the all-

important change in land use that should lead to improvement in the rural economy of Iran. It is thought that by this means a new awareness may be created among the people of the need for soil conservation and all that it implies.

Personnel

The following personnel is suggested for the first unit: one superintendent (foreign), one senior ranger, one extension specialist, four rangers, sixteen guards, four research technicians (one foreign), five assistants, ten laborers and six office personnel.

Buildings and Equipment

Housing on the project should be provided for the staff. Each of the four rangers should be quartered in a place suitable for managing the fourth of the project under his direction. Each guard should be quartered on his territory. Additional housing should be provided for machinery, supplies, laboratory work and livestock. The project would require 30 mules for riding and carrying.

Trucks, tractors, wagons, fencing and equipment for weather stations and stream measurement should be provided.

Type F—Moghan Plain

The Moghan Plain is a vast area lying at a low altitude on the east border of the northwest corner of Iran. It is a level to rolling tract of land about 60 kilometers long and 50 kilometers wide, with a rainfall of around 90 centimeters a year. The soil is fertile and will produce grain crops and forage without irrigation, but water, if available from rivers or wells, would increase the yield of crops.

Purpose

A demonstration farm in this area would deal with the production of livestock and the forage and other crops necessary for feed. The crops and livestock should be balanced so as to have a productive and economic unit. The dairy industry is not as important here as in some other parts of Azarbaijan and only enough dairy animals to supply products for home use would be included.

Recommendations

Organization

The demonstration farm would operate in two units, a main farm with a combination of dry land and irrigated crops, and an adjacent area for testing different grasses and systems of grazing. A small timber planting would be established as a shelter along the windward sides of the farmstead, and to furnish building timbers and fuel.

Land should be obtained from the Government and should be so located that irrigated and dry land areas lie adjacent to each other. We suggest the following land use program:

Kind of Crop	Hectares
Dry Land	
Cereals	100
Hay and pasture	200
Trees and fruits	20
Fallow	100
Total dry land crops	420
Irrigated Land	
Forage	50
Root crops	15
Vegetables	5
Silage	10
Total irrigated crops	80
Total one unit	500
Additional grass land	200

The following livestock is recommended:

Kind of Livestock	Numbers
Milk cows	5
Sheep	1,000
Goats	25
Horses	10
Chickens	500

Buildings and Equipment

Buildings should be provided to house personnel, livestock, machinery and feed.

A full line of mechanized equipment should be supplied for land preparation, seeding, cultivating and for the harvest of hay.

Personnel

A foreign farm manager and six laborers should be adequate to operate this unit.

Type G—Quchan

Quchan is in the middle of the plain of that name located some 150 kilometers northwest of Meshed. It is a rolling plain of higher elevation, with a short growing season, a considerable amount of grazing land and some cultivated land.

Purpose

Some outstanding sheep breeding work has been done by one of the sheepmen of Quchan who has been using a fat-rumped ram of exceptional size and body type to improve the local sheep. He has obtained twice the normal body size and weight of lambs in the first generation. A demonstration farm in this area should be set up to show improved management of pasture land, the development of forage and silage crops and the improvement of the local sheep by selection and the use of fat-rumped rams.

Recommendations

A co-operative agreement should be drawn up with this sheep breeder at Quchan whereby he would furnish the sheep, the land and the water; and the ostan station at Meshed would furnish a fur sheep specialist (foreign adviser), a crop specialist, and the machinery needed to operate the farm.

The fur sheep specialist, who should have training in lambskin (fur sheep) production and marketing as well as experience in sheep breeding, should advise the breeder on breeding methods, production and marketing of lambskins.

The crop specialist should develop the cropping system and supervise the pasture tests contemplated.

The breeder should have control of the sheep and cropping system, but should be bound to carry out the programs to which he agrees in consultation with the sheep breeding and crop specialists. In return for the services rendered the breeder by the ostan station, he should furnish each year a stated number of ram lambs for distribution to other stations and demonstration farms.

We suggest the following land use program for irrigated land:

Kind of Crop	Hectares
Cereals	10
Alfalfa	10
Trees for fuel and fruit	8
Silage	5
Root crops	5
Vegetables	2
Fallow	10
Pasture	50
Total	100

We recommend the following livestock: 250 sheep, 12 cattle, 3 horses and 200 chickens.

Type H—Hamadan

Purpose

A grass and grass seed farm near Hamadan is planned to demonstrate that drought-resistant grasses and alfalfa can be produced on dry-farm or range land, and that seeds of species valuable for developing this kind of land can be grown by dry-farm methods. The natural annual precipitation of 40 to 50 centimeters, the cool climate as a result of an elevation of near 1,800 meters and broad tracts of suitable soil make this a promising project for this vicinity.

Recommendations

Organization

This project should begin with 20 hectares to be increased to perhaps 500 hectares in a few years. Four selected landowners should begin to develop the project, but they may employ tenants later if desired. We recommend that 60 kilograms each of crested

wheat-grass (agropyron cristatum) and intermediate wheat-grass (agropyron intermedium) be brought in for experimental purposes by air freight and seeded in the fall of 1328 (1949). The Plan Organization should purchase the seed and distribute it to four land owners who should enter into an agreement to grow the crops under specified conditions.

The year 1329 (1950) will be required to establish the stand, during which year neither forage nor seed can be expected. In 1330 (1951), unless the season is unfavorable, there should be a small growth of forage and a small amount of seed. This should not be grazed unless it produces considerable seed. In this case it may be grazed lightly in the autumn after the seed is harvested. In the third and subsequent years a seed crop should be produced that may be harvested and used to seed additional land. If this is continued, it is likely that an area of 500 hectares could be in production after four or five years. Meanwhile seeds of several other drought-resistant species should be introduced and tested similarly.

Expansion

The landowner should undertake expansion as part of a dry-farm wheat production unit. The same machinery and land preparation may be used for grass production that is used for wheat, except that when seeding the drills need special attention to keep the seed flowing and the combine harvester needs grass screens. Otherwise no difficulty should be encountered. It is recommended that the range and forestry technician at the Hamadan station be the official adviser of this project. He should see that the work is properly done and the grass fields protected from grazing damage.

When the project reaches 300 hectares or more, each landowner should employ two or more tenants and aid them to start in the seed-growing business. The extension agent for the territory and the range and forestry technician at the experiment station should supervise the development of the relation between the tenants and the landowner, and aid in securing financial credit through the Plan for the tenants.

After the landowner is able to harvest 100 hectares of grass seed he should sell to others at a reasonable price at least one-half the seed produced under the direction of the range and forestry technician and the extension agent.

In a few more years, this project may involve many farmers and great areas of land. At that time the extension agent should take the initiative in forming a grass seed growers improvement association as a part of the seed certification program recommended in this section. (See "A Seed Stocks Program for Iran", page 103.)

Range Watersheds

As soon as 100 kilograms of grass seed are available for purchase, the Plan Organization should purchase the seed and use it to seed range land on a watershed that needs revegetation. The range and forestry technician should choose the place to begin the seeding and arrange for seeding the area. The land should be disced and seeded on the contour. It must be protected against grazing for two years after which it may be grazed lightly, leaving at least half the forage produced ungrazed.

These areas should be added to as rapidly as possible until the Plan is seeding 1,000 hectares a year. When the success is fully established, this seeding under Government auspices should be reconsidered and replanned on a really substantial basis.

Type I—Resht

Purpose

The demonstration farm at Resht should be used to test out the idea of producing rice with mechanization and by direct seeding in the field, and to demonstrate the desirability of a grain-livestock farm without irrigation, but with mechanized equipment.

Recommendations

Organization

Two hundred hectares of land should be procured from the Government without cost. This land should be potentially productive, subject to irrigation and drainage, and covered with brush and stumps. There is considerable land of this type in the area which is now non-productive. A bulldozer should be used to remove the brush and stumps, and to level one-half of the land for irrigation. The other half should be used for producing non-irrigated crops and may be cultivated with a minimum of leveling. The unit used for the production of rice must be provided with canals for irrigation and also for draining off the water before harvest time. Half of the land should be used in each system of farming and the two units should be close enough together to use some buildings and machinery in common. Both should be under the supervision of a foreign professional farm manager.

Simple tests of crop varieties, time of planting and use of fertilizer may be conducted on these units by the manager under the supervision of the director of the ostan station. The farm should be organized and operated to demonstrate systems of farming adapted to the soils and climate of the area and use of the land, water, labor and machinery to secure the largest net income.

On both units, forage should be produced for use by livestock. The livestock now produced in the Resht area are of poor quality and habitually in bad condition, despite the abundance of plant growth in the swampy areas adjacent to the rice fields. No crops designed for livestock feed are now being grown. It is anticipated that the livestock from these units may be grazed at times on nearby forest areas.

Buildings

Buildings should be constructed on the unit to house the manager, the person in charge of the livestock, and the three machine operators. The laborers should be hired from the surrounding area and need not live on the unit.

Machinery

The major machinery should consist of a bulldozer to clear the land and make canals, one three-plow tractor for each unit and one combine to be used jointly between the two units. Other machinery necessary for cultivation and transportation should be added. One well should be drilled to supply safe water for the personnel and livestock.

Crops

The crops produced on one unit should be rice, jute and forage. On the other unit wheat, tobacco and forage may be grown with a separate area for a tea plantation. Improved practices developed at the ostan station should be demonstrated on this farm.

Pure seeds and improved breeding stock may be produced for sale to other farmers in the area.

Costs

This unit should be used primarily as a demonstration and must therefore be profitable and operated in such a way that farmers in the area may use the same type of organization and the same practices. Since waste land is being reclaimed by a large input of capital, the accounts kept on the farm must segregate the cost of reclaiming the land from the cost of operating the units after the land is put in condition to produce crops.

The buildings (except the house for the manager) must be of such construction that farmers would find them both cheap and useful. Labor should be hired at the prevailing rate, but may be paid a bonus at the end of the year for faithful performance.

Any research work done on this farm must be of such a nature that it will not lower the net income from the unit. Added costs for planting and harvesting small areas for experimental purposes must be charged to the ostan station. It is important to cultivate areas large enough to use the tractors and machinery to full capacity, and the labor must be limited to that necessary to secure a high level of crop and livestock production.

EXTENSION AGENTS

Extension agents should be appointed, including some experienced foreigners, for important agricultural areas where neither ostan stations nor demonstration farms are located. They should be locally responsible to the superintendent of the nearest ostan station. They should be expected to carry out a constructive program of adult education with rural families. It should be their job to explain to farmers the advantages of adopting practices proved to be profitable by the research workers at the ostan stations and substations.

They should be expected to assist with any special programs launched in their territory, such as disease and insect control programs, emergency relief programs, and the organization of companies or co-operatives to serve rural people. They should cooperate in health improvement and educational projects.

The extension agents must be men with a broad training in agriculture, having sound judgment and the ability to gain the confidence of peasants and tribesmen. They must be interested in the welfare of the peasants, be willing to live in isolated places and to spend much of their time working in rural communities.

They should be provided with transportation, which will take them to areas having poor roads. They will need office space and the part-time service of a clerk-stenographer.

The extension agents should play an important part in determining the type of research work needed. They should be in a position to know the problems which are most critical in their areas. They should keep the Ministry of Agriculture informed (through the associate director of extension) as to the need for special programs to combat insects, control diseases, or cope with a famine situation.

SPECIAL PROJECTS

EMERGENCY RELIEF AND REHABILITATION

Famines among livestock and humans have been a periodic occurrence in Iran. We visited two of these famine areas during our inspection tour in the early part of 1328 (1949). One famine situation was found at Zabol in Sistan, and the other on the Moghan Plain in the northeastern part of Azarbaijan where a large number of livestock died due to drought conditions in 1327 (1948) followed by heavy snows and low temperature during the winter. The Shahsavar tribesmen of this area used up not only their reserves of feed but also their life savings in providing feed for their livestock. Despite their heroic efforts, a late snow storm resulted in heavy losses of the remaining livestock. These unfortunate tribesmen were left with practically no animals to carry them and their possessions to another area where they might find relief, food and some means of earning a living.

A permanent organization should be set up in the Ministry of Agriculture to take care of famine and disaster victims through a well-organized and effective program of relief and rehabilitation. A sufficient number of trucks should be available to transport food into famine areas when necessary, and to transport people out. Road maintenance crews with equipment should be available to repair quickly roads washed out by floods, or cut up by trucks.

A permanent organization of national scope can do much to point out and alleviate conditions, which, if left to their natural courses, will result in famine due to crop failures, shortage of natural forages, and winters with excessive snow and prolonged cold temperatures. Such an organization should have information on file concerning feed supplies, in order that immediate action can be taken to get such feed to stricken communities. It should be empowered to make loans at low interest rates to stricken people for food for themselves and feed for their livestock. It can co-operate in building up food and feed reserves.

An efficient organization is vital to the success of any emergency-rehabilitation program, as the procedure must be swift and decisive, the leadership above reproach and the members carrying out the program well informed and with emergency powers to commandeer such facilities as may be necessary to cope with the situation quickly and efficiently.

Organization

A national emergency rehabilitation committee of three persons should be created, which should consist of a director appointed by the Ministry of Agriculture, one member appointed by the Ministry of Health, and one appointed by the director of the Plan Organization. The director or his administrative assistant should spend sufficient time in travel to know the conditions in the country. Agricultural extension agents can help to gather and assemble such information.

During emergencies the director should have the authority to commandeer such facilities in and around a stricken area as are necessary to carry out an effective program; to call in mobile health and veterinary units from nearby ostan stations; and to use specially appropriated funds for the purchase of seed and livestock. He should lease machinery from custom operators as and when necessary, such machinery having been

made available to custom operators through the farm machinery section of the Seven Year Plan.

When the mobile units of other organizations are called in for emergencies, the operating expense of the units should be taken care of by the director of welfare from the appropriated emergency funds which should be secured by the Minister of Agriculture. Funds for the overall organization and for travel of the director and his assistants should be furnished by the Plan Organization. The extension service should co-operate by making the extension agents of a famine area available during the emergency period.

The extension agents can do much over a period of years to prevent the occurrence of famines by teaching the production and storage of feed for livestock. They can also be constantly in contact with local conditions to warn the director of the national committee of impending needs so that help may be available before conditions become critical and livestock losses heavy.

ANIMAL IMPROVEMENT AND DISEASE CONTROL

We recommend a special animal improvement and disease control program for the important livestock areas, the purpose of the project being to provide trained personnel who will move among the tribes in mobile units. The staff for each unit should consist of three persons: a mature extension worker with a broad experience in animal production, and two assistants to supplement the leaders activities so that the three can cover the fields of livestock management, range management, livestock diseases, health and sanitation. This work should be co-ordinated with the rural education program. These persons must be able to gain the confidence of the tribesmen and villagers with whom they work. They should perform the following functions:

1. Teach methods of growing forage for winter use.
2. Organize the tribes for better management of the grazing areas.
3. Diagnose animal disease and recommend treatments.
4. Train local persons to vaccinate animals and supervise the distribution of vaccines and medicines.
5. Teach improved practices of livestock management such as:
   a. Selection of improved sires
   b. Castration of inferior males
   c. Proper culling of females
   d. Co-ordinated breeding, feeding and marketing programs.
6. Organize livestock shows or fairs to demonstrate superior types of animals and to create a spirit of friendly rivalry.

Organization

The project should be organized in the Plan Organization with the Ministry of Agriculture co-operating. The details of this project should be worked out by each ostan superintendent so that the extension agents may co-operate in all phases of the program. The ostan specialists in related subjects should provide up-to-date information for the personnel of the mobile units and the extension agents. The extension agents should

co-operate with the personnel of the mobile units to train vaccinators and to help organize the disease control program in co-operation with the Ministry of Agriculture.

The personnel of the mobile units will assist in programs of education and health as outlined in the education section (Vol. II).

Mobile Units

The mobile units should be made up on heavy truck chassis with sufficient power and clearance to travel in country districts. They should have sufficient space for a small laboratory, educational displays for all phases of the work, living quarters for the staff. Experiences with colored slides have demonstrated the advantages of visual education. Slides, slide films, and 16mm films should be made available for the mobile units.

A light weight vehicle (such as a jeep) should be provided to reach points not available to the heavy truck. Horses or mules may also be used to reach the more remote areas occupied during the summer grazing period.

It is recommended that mobile units be set up for Khuzistan and Azarbaijan during the first year of the Plan and that the service be gradually increased until all the major tribal areas are served. This may require a total of 15 to 20 units.

PLANT DISEASE AND INSECT CONTROL

Plant diseases and insects currently cause great damage to agronomic and horticultural crops in Iran. The problem is recognized by the Ministry of Agriculture and efforts are being made to improve the control program. The primary difficulties seem to be a lack of chemicals, certain types of power equipment, and an organization for conducting a control program. The Seven Year Plan should be a means of helping to overcome that situation.

Effective control of crop enemies requires scientific knowledge about specific insects and diseases. Each one must be studied carefully and thoroughly to learn the life history and characteristics under varying environmental conditions. It is only after such information is available that man can know how and when to apply control measures.

Research studies have been made in Iran to gather the basic data concerning some of the major crop diseases and insects. Thus it has been estimated that locusts (Moroccan type), sen bugs, and certain smut diseases reduce wheat yields alone by 300,000 metric tons annually. Tree fruits, grapes and citrus are seriously damaged every year by various diseases and insects. Likewise, such industrial crops as cotton, sugar beets and tobacco are reduced in both yield and quality of product by plant enemies. Thus, knowledge about some of the pests and how to control them has not been entirely lacking.

Research and Extension Assistance

The proposed Research and Extension Institute should provide assistance to the Ministry of Agriculture in its pest control campaign. The research entomologists and plant pathologists to be located at the various ostan stations and substations should be in a position soon to contribute scientific knowledge to that now available about diseases and insects which occur or prevail in their specific areas of work. They should be able to outline also the most up-to-date control measures.

The agricultural extension specialists and agents in the various ostans should have the necessary experience to organize the control work at the local level. They should collect and send in to the ostan centers regularly the specific information about the time of occurrence and the prevalence of the various pests. They should work with the landowners and villagers also in accomplishing the following:

1. Secure and provide storage for supplies of control materials.
2. Make sure that the necessary machinery and equipment for spraying, dusting, or seed treating is on hand.
3. Arrange for such local labor as may be needed to help the Ministry representatives carry out the actual control work.
4. Contact landowners and/or villagers to work out calendar schedules for doing the spraying, dusting, or seed treating.
5. Make local arrangements for the physical needs and comfort of the personnel charged with carrying out the programs.
6. Keep responsible administrative officers advised regarding the progress and results of all campaigns.

Recommendations

Organization and Program

We recommend that as soon as the Research and Extension Institute is established, the Minister of Agriculture and the director of the Institute designate from among their respective personnel a co-ordinating committee to develop a nationwide disease and insect control campaign. One man, presumably from the Ministry, should be named to direct the overall program. He should organize the work within the Ministry by designating trained and experienced individuals to handle the details for each major group of pests. The Ministry director also would work through and with the associate director of extension in the institute to set up working committees of Ministry and extension personnel in each ostan or province.

If competent men are secured from abroad to staff the positions in entomology and plant pathology under the Institute program, it should be unnecessary to bring in additional personnel just for the disease and insect control work. The Ministry, of course, may find that additional top-level workers are needed for its part of the program.

It is recommended that Plan funds be used, throughout the seven years if necessary, to supplement Ministry funds for purchasing chemicals and equipment and for general operations. No plan funds should be needed for salaries since no Institute personnel should be assigned specifically to this one project.

Plant Quarantine and Fumigation

A plan was proposed by the agriculture section of the Provisional Planning Board for establishment of a plant quarantine and plant products fumigation service. There is distinct merit in the idea; however, it is not a project that will add quickly to food production in Iran nor should such a plan be put into operation hurriedly.

We recommend that the Ministry initiate a study of the problem with assistance to be given by personnel from the Research and Extension Institute when they become available. It will be necessary to develop a detailed plan for such a program which

will involve national legislation to regulate incoming and outgoing shipments of plant materials and products, the construction of buildings at strategic points for quarantine and fumigation operations, and the training of a staff.

Such a service should be primarily regulatory in nature and it should be established as a function of the Ministry of Agriculture. While Seven Year Plan personnel should help to organize this service, we recommend, at this time, no use of Plan funds for it.

A SEED STOCKS PROGRAM

One of the most important items in a program of increased agricultural production in any country is that of having available an adequate supply of planting seed. Unfortunately, too many people think incorrectly that almost any seed of any given crop will be satisfactory for planting purposes.

Seed quality is the result of two factors, physical and intrinsic. The physical quality may be exemplified by those things which meet the eye of an observer—clean, bright, plump seed which has matured under favorable weather conditions, and is free from damage, foreign material (trash) and weed seeds. The intrinsic quality of seed is much more difficult to understand or to describe. Research plant breeders speak of the hidden quality as "genetic purity" which should be reflected in plant vigor, yield and quality.

Plant breeders today, working at research institutions, develop new strains and varieties of all sorts of crop plants by special breeding techniques. The new varieties may have improved yielding abilities through better adaptation to certain growing conditions or through resistance to certain diseases or insect pests. Unfortunately, unless there is some well-organized system established for maintaining genetic purity, the better qualities may soon be lost. Purity of desirable strains must be preserved. Mechanical admixtures of seed in the hands of growers (at cotton gins, for example) or natural cross-pollination between different varieties growing in adjacent fields, are common causes of loss. Both types of mixtures may be equally serious.

In several countries, specialized organizations have been developed to safeguard and increase planting-seed stocks. Some such organization is needed in Iran if satisfactory increases in the scale of crop production are to be carried out.

Some of the agronomic crops for which a pure seed program should be developed at an early date are cotton, flax, rice, sugar beets, tobacco, wheat, barley and alfalfa. Some vegetable crops, no doubt, also should be added to the list.

Under such a seed stocks program seed of known genetic composition is produced under careful supervision and distributed (sold) to farmers, usually under the name "certified" seed.

Plant breeders, working at experiment stations, produce the basic seed of new and improved strains or varieties. Such basic seed, before its release to growers, usually is called "breeder's" seed. Various methods are used to increase the breeder's seed during two or three years to get enough to distribute to selected growers. The first increases may be made on experiment station farms, if land is available, so that extra care may be given all steps in the process.

The first increase by private growers must be made on clean land so that there will be no danger from volunteer plants of the same or similar crops. Also, the land must be

isolated from other varieties (for crops which may cross pollinate), and the fields must be inspected during the growing season to find and remove any off-type hybrids or "rogues" which may be present. This seed generation usually is classed as "foundation" seed. The seed itself must be well handled, cleaned, tested for viability, then, if it meets certain established standards, it is labeled as foundation seed.

If another seed generation is required to get sufficient volume for distribution to the general public, the increase from foundation usually is called "registered" seed. It, too, must have been grown according to definite regulations set up for each kind of crop. The registered seed is grown only by carefully selected growers. In the case of sugar beets the sugar factory managers should be in a position to help select growers to produce the registered seed. With cotton, the gin managers should know the growers or the villages capable of producing the registered seed in a satisfactory manner.

In the following year the registered seed is planted, under somewhat less strict regulations, with the increase being labeled and known as certified seed. That class of seed should be available in sufficient volume to be distributed to a large number of commercial growers. They will plant the certified seed, of cotton or sugar beets for example, simply to secure a good crop yield of known quality.

To get certified seed of any crop into the hands of commercial growers, various commercial organizations may play an important part. In Iran, cotton gins, sugar or tobacco factories, for example, might serve as distributors of certified seed. Fixed prices may be established for such seed with the idea of making it available to all growers at reasonable prices. In some cases, as with cotton, the improved seed might be exchanged for ordinary seed, which could be sent to the oil mill, for which purpose it would be quite satisfactory.

The following outline shows a scheme by means of which certified cottonseed could be produced in Iran:

Year	Class of Seed Planted	Amount of Seed Planted	Class of Seed Produced	Amount of Seed Produced	Where Grown	Purpose or Distribution	How Distributed
1329	Breeder's seed	1 kg or all available	Breeder's seed	50 kg or more	Exper. station farm	Held by breeder	—
1330	Breeder's seed	50 kg or more	Foundation seed	1½ tons or more	Exper. station farm	Held by pure seed Commission	To a few selected growers
1331	Foundation seed	1½ tons or more	Registered seed	75 tons or more	On selected farms*	To selected villages or growers	Through the pure seed Commission
1332	Registered seed	75 tons or more	Certified seed	800 to 1,000 tons	Farms of selected villages	For the general public	By cotton gins, etc.

* Some of the increase of registered seed may be done on experiment station lands. The rate of increase, of course, can be much more rapid if there is more breeder's seed with which to start the program.

Recommendation

Seed Increase

1329 (1950)

The plant breeder at Karaj or at one of the outlying experiment station farms may have on hand one kilogram (more or less) of seed of an improved type of cotton.

It has been approved by a technical group (to be known as the pure seed committee), made up of interested workers in the Research and Extension Institute, the College of Agriculture and the Ministry of Agriculture, for inclusion in the certification program. That seed is planted carefully by hand on the best land available and well removed from any "foreign" cotton with which it might cross pollinate. The seed cotton produced should be ginned on a small laboratory gin to prevent any possible mixing with other seed. The seed produced should be carefully labeled as breeder's seed and stored in a safe place.

1330 (1951)

The increased amount of breeder's seed again should be planted on one or more of the experiment station farms where the new variety presumably is adapted. The planting should be on clean, isolated land, and made at the lowest rate consistent with good culture in order to secure the most rapid increase of the seed. During the growing season, the plants should be inspected in the field to look for and remove any possible off-type plants (rogues) before they bloom. Only trained personnel can and should do such inspection work.

Again at harvest time the seed cotton should be carefully gathered and ginned to prevent damage or mixing. The seed (amounting to perhaps 1½ tons or more) should be sacked in clean bags and labeled as foundation seed. This seed should be kept at one of the designated experiment station farms in the custody of the pure seed committee.

1331 (1952)

During the 1330-31 (1951-52) winter season, plans should be worked out for the distribution of the foundation seed to secure its increase to the class of registered seed. Some of the foundation seed should be kept for increase at one or more of the experiment station farms as a measure of insurance against loss. A fair amount, however, should be distributed to growers, or perhaps whole villages, selected carefully in a few areas where the new variety will be grown eventually.

The objectives of this third stage of the program should be to increase the foundation stock to registered seed as rapidly as possible and to acquaint growers with the new variety.

Again in this stage, clean land, isolation against cross pollination, and field inspection must be provided. As soon as farmers are involved in the program, as they will be at this stage, the actual growers should be given some training in the so-called roguing work. The operation, to be successful, should be carried on more or less continuously throughout the growing season.

At harvest time, representatives of the the pure seed committee should make arrangements for ginning, make sure the gins to be used are cleaned to remove seed of any other variety, and for someone to be on hand when the ginning is done to take charge of the seed and label the sacks for further protection.

Later, samples of this seed should be tested for germination. If the seed is found to be satisfactory in all respects, it should be labeled as registered seed and all of it should be stored under safe conditions arranged for by the pure seed committee.

1332 (1953)

The 75 tons or more of registered seed should be distributed, after careful study, to several villages each of which should grow just the one variety of cotton. The farmers in those villages should be informed as to the importance of their part in the program and they should be encouraged to give the crop good cultural treatment. Of course, precautionary measures should be taken to prevent and/or control diseases and insects which might damage the crop.

Inspection should be made of all fields during the early blooming stage and perhaps again later, with off-type plants being removed if found. Arrangements should be made to provide clean ginning facilities at each village for that part of the crop which will be saved for seed. The late season crop, in case of frost injury, usually should not be kept for planting.

After ginning, again all lots of the seed should be tested for germination and general quality. If satisfactory, the seed should be sacked and labeled as certified seed. In the following season, this seed should be distributed widely for planting, by the general public, in those areas where the variety is known to be adapted. That distribution might well be worked out and handled through gins and perhaps through cotton mills.

The foregoing program with some variations has worked satisfactorily in the United States with cotton. By making some changes in procedures, the same general plan can be adapted to other crops such as tobacco, sugarbeets, rice and wheat.

Organization

The seed stocks program should be organized on a nationwide basis as one of the activities of the Agricultural Research and Extension Institute. The national organization might be called "The Crop Improvement Association of Iran" and eventually there should be branch societies in each ostan or province. Each organized group would be helped by the local extension service agent both to get organized and to carry out the seed increase and certification program with the crops grown in the area.

The association should have an executive secretary or manager who might be employed by and headquartered at the Ministry of Agriculture or at the Institute. In addition to the manager there should be some office help for keeping records and a trained seed analyst to run purity and germination test on program seed. Office and laboratory space, and some seed laboratory and office equipment, will be required for these activities. At least one car and one jeep and travel funds will be needed since much time will be spent in travel to organize and operate the program.

IMPORTATION OF MACHINERY

The importation of farm machinery and allied equipment should be organized to serve the following purposes:

1. To assist in bringing into Iran farm machinery and farm equipment, both for crop and livestock production and for some phases in the processing of products such as milk and fruit.
2. To help establish local farm machinery services for providing repairs and mechanical services to farmers.
3. To place machinery and equipment, in so far as possible, where it will do the most to increase total production and to raise incomes of the peasants.

Private Dealers

The initial purchasing of farm machinery is a very small part of a successful program to place farm machinery in the field and to keep it operating. This program will require some of the best business men in Iran as well as considerable capital which private investors can supply. A healthy situation in the farm machinery program depends upon strong competition with a number of dealers. With the help of their respective foreign manufacturers, local dealers can be of utmost importance in making the use of farm machinery successful in Iran, just as they have been in other parts of the world. Some are already established, and necessary channels for bringing in equipment are functioning. With some help from the Seven Year Plan, these private businesses are willing and competent to assume responsibility for this phase of the agricultural program. If dealers are bypassed in the purchase of machinery, however, and are denied reasonable profits they cannot and will not invest capital or manpower to do the job that needs to be done. Then the entire job of purchasing, distributing, supplying parts and servicing would have to be done by a single agency for all of Iran. The success of such a plan would be extremely doubtful.

While there may be some dissatisfaction with the present dealer organization, it is believed that existing deficiencies can be overcome by proper supervision, and that a thriving private enterprise can be developed to carry on at the end of the Seven Year Plan.

Proper Sizes and Types

Many kinds of farm machines and equipment are needed in Iran. Farm machinery heads the list, but there are other items, such as hand-propelled garden tools, animal-drawn equipment, windmills, small water supply pumps, gasoline engines, grain storage bins, special farm building materials, dairy farm equipment and many others.

Dealers in Iran have had very little experience with any machinery. Landowners and farmers have practically no knowledge by which they can judge the merits of these various items. To assure importation of high quality merchandise of the proper sizes and types, we recommend that an experienced foreign agricultural engineer be placed in the planning organization to consult with dealers, factory representatives, lending agencies and the Government to assist them in determining what should be brought in and in what part of Iran it is needed.

Foreign Exchange

The importing of farm machinery and equipment deserves more foreign exchange than has been available to date. A considerable demand for farm machinery already exists. It is recommended that the amount of foreign exchange be increased to more nearly satisfy that demand, after the Seven Year Plan is in operation to guide in selecting the machinery and placing it where it will do the most good without upsetting the present economy.

Financing

To make it possible to bring needed farm machines and equipment into Iran and to get it into the hands of the proper individuals, it is recommended that a system of financing be set up. This financing would be limited to equipment over which the Plan Organization has control. The Agricultural Bank (or its successor) should have Plan funds to provide capital for such a program. The net interest rate should not exceed six per cent.

The following are recommended phases of the financing plan.

Loans to Dealers

Dealers must deposit money in foreign banks at the time orders are placed. These funds are tied up until the machinery can be delivered to Iranian purchasers, which usually requires five or six months. If credit for this operation can be secured at reasonable interest rates (as contrasted with 25 to 30 per cent now charged for the portion borrowed in the open market) prices to farmers can be reduced.

Loans to Farmers

Loans to farmers should be made on a five-year basis for landlords, and peasants who are on demonstration farms organized under the Seven Year Plan. On those farms machines will be operated under the supervision of a farm manager responsible to the Plan Organization.

Loans to Custom Operators

Loans should be made to individuals who will use farm machinery on a custom basis. These projects will be organized on a group basis to do machine work for peasants on a fee basis in areas where certain crops require machinery for efficient production. These units also will be supervised by farm managers.

Local Machinery Service

The successful use of farm machinery depends to a large extent upon the availability of repairs and expert servicing when needed. To have those available in Tehran is not enough; they must be available in farming areas all over Iran wherever tractors and machines are being used. Farm machinery dealers, with the help of their manufacturers, can best provide those local services. The factories can assist in setting up the overall branch and can bring in factory-trained mechanics to instruct local mechanics and to provide special tools that may be needed for particular tractors.

The agricultural engineering specialists of the agricultural extension service should organize the local dealers to assist in training farm workers in the operation and care of

machinery. Special classes should be organized in each community where tractors and harvesting machines are introduced. In many instances, these classes may be held at the headquarters of the local dealers. The extension specialists and the extension agents should be responsible for organizing the schools and for securing the enrollment. The dealers should furnish the local facilities and part of the teaching staff.

Though dealers should be expected to provide local service they need the assurance of a reasonable profit. The present margin of 15 per cent permitted by the Government is not enough to provide these extra services and is not in line with usual business practices. The investment in a building, shop tools, spare parts, salary of a mechanic and a manager amounts to a sizable sum. The margin necessary to keep an efficient dealer in business with a reasonable profit can be reduced if the dealers can be encouraged to concentrate their machinery sales around local service units. That should provide a sufficient volume of business in the area to make these services self-supporting.

If adequate margins are allowed dealers and prices are determined for various machines, sales should be made accordingly. To help control prices, no loans, through the financing plan previously discussed, should be made to dealers who violate the practice of fair pricing. Also, the Plan Organization should, if necessary, seek the co-operation of manufacturers to cancel any dealer franchise where such violations are common.

Proper Use of Machinery

Demonstrations in Ostans

The use of various machines and the methods of farming adapted to machine use should be demonstrated in the ostans. This will give local people a chance to see the advantages of new methods and to learn how machines can be employed most economically. Such demonstrations have been described previously.

Tractors for Sugar Beet Production

A special demonstration should be located in sugar beet centers. Plan funds should be spent in connection with each sugar beet factory, to introduce low cost methods of production. This idea is discussed briefly also in the industry and mining section (Vol. IV). Loans should be made to selected operators or groups of farmers for the purchase of machinery, the loans to be repaid in three to four years. The first step should be to get five complete tractor and machinery units in each factory area. Plan funds should be used to employ a foreign agricultural engineer to introduce modern methods and to supervise the operator of the machines for a period of two crop seasons. Two such demonstrations should be started the first year and the balance the second year.

Sugar beet factories should be asked to provide space for storage of spare parts and repair shop service. The custom operators should pay for services rendered by factory mechanics. Plan funds should be used to stock spare parts, with repayment over a four-year period. Loans to farmers when necessary should be provided by the Agricultural Bank to pay operating expenses.

Personnel conducting these projects should work closely with the superintendent of the nearest ostan station to make use of available technical information.

Custom Operators

The simplest method of giving small farmers a chance to use farm machinery for one or more operations in the growing of a crop is to have a custom operator in the area with a complete set of machinery to work on a fee basis. That permits farmers to have the use of machines without an investment in them. Custom operators should have certain advantages over co-operatives at this stage of agricultural development in Iran. The most important is that one individual would be responsible for keeping the equipment in operating condition. The additional profit from more continuous operation is a factor which can increase the services rendered by any one unit. Plan funds should be used for loans to custom operators and preference given to those who will operate in areas suggested by the Plan personnel. The agricultural engineering specialists at ostan stations and demonstration farms should provide assistance to make the work of the custom operators successful.

Co-operative Ownership

Some demonstrations are planned for co-operative ownership of more expensive machines having a large enough capacity to serve more than one farmer. Plan funds should be used for loans on such equipment. Details of those projects are given under the heading, "Demonstration Farms".

Organization

A separate organization should be set up within the Plan Organization. It should be headed by a foreign agricultural engineer to be responsible to the Plan Organization. Other agricultural engineers in experiment stations and on demonstration farms should have the responsibility of keeping this organization informed as to the requirements for machines in their territories and the adequacy of dealer services.

Personnel needed for each sugar beet project would consist of one foreign agricultural engineer and one Iranian assistant.

Each factory should be provided with five sets of machinery for seedbed preparation, planting and cultivation. Each set should include two-plow tractors, disc harrows, beet planters, cultivators, harrows and wagons for harvesting operations.

COMPANY TO SUPPLY GOODS TO PEASANTS

A high percentage of peasants in Iran are forced to borrow money at high interest rates for living expenses and for producing their crops. At harvest time many of them are forced to turn over to their creditors the bulk of the produce from the two to five hectares of land operated. Goods are furnished to them by money lenders at high prices and repayment is made in cereals and livestock products at normal marketing seasons when prices are low. Interest rates are reported to range from 25 to 35 per cent. In many villages tea, sugar and cloth are sold to the peasants by peddlers who bring their wares on the back of a donkey. Distribution methods contribute to large price spreads.

Recommendation

We recommend that Plan funds be used to organize a company for the distribution of goods to village stores, where credit can be advanced at low interest rates. Such stores should be established in those villages where landlords and peasants enter into

an agreement with the company and where each party is willing to contribute to the enterprise.

The company should perform the following functions:

1. Purchase staple goods at wholesale prices. Government-controlled goods such as sugar, tobacco and in some instances grains may be procured at less than wholesale prices.
2. Deliver goods to village stores at regular intervals.
3. Collect for goods sold since last visit.
4. Purchase village-made goods at co-operating points for sale to stores in other locations. (Cloth, rugs, utensils, etc.) This service may be expanded later to include the purchase of farm products for sale in cities.
5. Extend credit where necessary against the next year's crops. Credit should be extended only to peasants who reside in the village where the store is located, but goods might be sold to peasants of neighboring villages for cash or in exchange for products.

The landlord should:

1. Furnish a building in which to locate the village store.
2. Keep the records necessary to settle accounts.
3. Agree in writing not to operate a competing enterprise.
4. Keep custody of goods and/or funds until turned over to the company representative.

The peasants should agree to the following:

1. To furnish the labor to operate the store.
2. To pledge their growing crops to secure advances made by the store.

Benefits

The landlord will benefit by having a better satisfied and more co-operative group of peasants. Such a system should improve the landlords' standing in the national economy and it may help to prevent unwise legislation against landlords. The peasant will benefit by making his purchases at lower prices, the quality of goods may be improved, and credit will be extended at low rates of interest. Larger stocks of goods also should relieve the peasant of making long trips in search of the supplies needed.

At the national level the project should do much to combat those influences which tend to breed discontent among the peasants. This is very important in some areas. The project is one which could be put into operation quickly, it would benefit many people, and would attract nation-wide attention to the Seven Year Plan.

Organization and Operation

The company should be organized on a national basis with a foreign administrator and an Iranian adviser. Two district supervisors should be appointed by the Plan Organization to be responsible to the administrator in checking on operations at the ostan level. The business should be organized with a supervisor in charge of ostan

centers, in cities large enough to furnish supplies in wholesale quantities. Most purchases would be made by the ostan supervisor who would have one assistant to serve as contact man and to organize the business in the villages. Additional personnel would include truck drivers and laborers.

The success of this enterprise will depend largely upon the honesty and integrity of the personnel involved. The director and his adviser should be men of unimpeachable character. The district supervisors must be honest and loyal to the director so that dishonesty at the ostan level can be detected and punished. Authority to do business, according to principles established by the company, should be delegated to the ostan supervisors. Failure to carry on honest and efficient operations should be grounds for dismissal.

Purchasing on a national basis, with attendant transportation problems, should be done only when necessary to get the goods needed or when company profits from such a practice would be large.

The margin between wholesale and retail prices should be limited to an amount which will cover operating costs except for the salaries of management at the national and regional levels. Interest rates collected should not exceed six per cent but should be sufficient to keep the parent bank operating if it is efficiently organized and operated. Credits for this and similar ventures are specifically provided for in the Seven Year Plan.

Equipment

One jeep and three 1½-ton trucks should be provided for each local or ostan unit. Four cars will be needed by the personnel at the national level. Operating expenses for this equipment at the ostan level should be paid out of profits, and equipment to be added after the initial supply should be purchased from company funds.

Buildings

Buildings should be rented the rentals being paid out of company receipts.

SWAMP DRAINAGE

The malaria problem of Iran is increased greatly by the prevalence of numerous areas of swampy lands. Some of the swamps are of more or less natural occurrence; others are man-made or at least contributed to by irrigation farming practices. In some instances, the swamps could be eliminated completely or at least controlled effectively by soundly-executed drainage schemes.

Malaria control, under the Seven Year Plan, is an important part of the health program. The health problem, however, is of great concern to agriculture. Under the proposed health program, control of the malaria-carrying anopheles mosquito is to be attacked mainly through a DDT spraying campaign. It would seem logical to combine with the spraying campaign some attention to swamp control or elimination.

Recommendations

We propose that a swamp control program be initiated under the agriculture section as an experiment in malaria control in co-operation with the health program.

It is suggested that a few areas be selected throughout Iran where the swamp control project would be initiated. Four areas have been suggested as having serious swamp conditions that are contributing to the malaria problem which might be used as trial areas: Khoy in Azarbaijan, Isfahan, Shiraz, and Shahriyar (near Karaj). A careful study should be made first by competent drainage engineers to determine the possibility and practicability of each drainage project before any operation is undertaken.

The costs of surveying the proposed projects, of securing adequate equipment for constructing open drainage channels, and of providing skilled operators should be furnished from Plan funds. Any expenses for semi-skilled or unskilled labor might well be taken care of by the Ministry of Public Health or perhaps by the municipalities concerned.

If the first trial projects work out satisfactorily some plan should be devised to expand the program to other needy areas.

Dredging or ditch-digging machines purchased for these drainage projects probably could be used later for building irrigation canals and ditches or perhaps for highway construction work. Machines would soon pay for their cost on a drainage project. Current estimates indicate costs of about Rls. 30 (nearly one dollar) per cubic meter for ditch-digging by hand, whereas costs in the United States, where power equipment is used, average only about 6.5 cents per cubic meter.

Personnel

Surveying personnel for such a project should be available through the central engineering department of the Seven Year Plan.

One ditch-machine operator, one semi-skilled mechanic and one or two laborers should be sufficient to handle each of the trial projects after the surveys are finished. Estimates of costs are difficult to make without more information about the scope of each project. It is probable, however, that the skilled operators required could be transferred readily to other lines of work after completing the drainage operations.

Equipment

Only one machine should be purchased the first year, to be used in the most promising area. If the project continues to give promise at the end of the first year, additional machines may then be added.

INSPECTION SERVICE FOR MEAT AND MILK

At the present time about 120 veterinarians are engaged in the inspection of meat at slaughter houses in the larger cities of Iran. This inspection is done by representatives of municipalities. There is little or no inspection of milk.

Inspection of meat and milk should be carried on by the Ministry of Agriculture and so organized as to provide pure meat and milk products for the people of Iran.

Meat inspection should be conducted at all public slaughter houses, and it should be accompanied by an educational campaign designed to acquaint the public with the dangers of eating uninspected products. The inspection service should be made available in all centers large enough to utilize the services of an inspector.

Requirements

The Ministry should set up a list of requirements for inspectors and the veterinary school and agricultural college should set up courses of study both to define sanitation standards for meat and milk and to insure well-trained inspectors and laboratory technicians.

The Ministry should provide enough laboratories in the larger cities to carry on the bacteriological and pathological work which will be necessary to insure efficient inspection of meat and milk.

A comprehensive set of rules and regulations should be formulated by the Ministry and eventually enacted into law to govern the action of inspectors and to determine their authority in condemning meat or milk products. Proper steps should be taken to protect inspectors from the influence of market officials and animal owners. The inspections service to be successful must be honest.

Inspection of Milk

There is no inspection of milk at the present time, even in Tehran. Much of the milk sold is half whole milk and half separated milk; sometimes it is diluted with water. The system of price fixing as practiced by city officials should be altered as it has little relation to supply, demand, or quality and it tends to lead to inefficiency and dishonesty. The milk situation in Iran could be improved effectively by the following steps:

1. Prices should not be fixed; they should be determined by supply and demand.
2. The sale of adulterated or diluted milk should be prohibited.
3. All milk sold should have a minimum content of 3.5 per cent butter fat.
4. A sound inspection service should be devised and milk inspectors should be trained thoroughly to carry out the program.
5. Each city eventually should have a laboratory, set up by the Ministry of Agriculture for the analysis of milk samples.
6. The Ministry of Agriculture should sponsor a co-operative cow-keepers' association among the 200-odd cow-keepers in the Tehran vicinity. This association should put up a modern dairy products plant and all milk produced by its members should go through this dairy plant where it would be pasteurized and bottled or used to produce sanitary dairy products. Later similar associations should be organized in other consuming areas.

The Ministry should issue certificates to cow-keepers who have cleaned their premises so as to produce milk of a high quality. Non-conforming producers should be denied association privileges. The co-operative association, by voluntary agreement of its members, should set up a schedule of prices for its products which would provide

for a margin above the open market price to allow for the difference in quality of the products.

The Ministry of Agriculture should set up a section to deal with the problem of tuberculosis and brucellosis in milk animals, and steps should be taken to study the problem of infection of meat and milk products by these two diseases, which are readily transmitted to humans. This section should make a report to the Plan Organization concerning the problem, with recommendations as to a program to control these diseases in milk animals. The Ministry of Public Health should co-operate with the Ministry of Agriculture on this program, funds to be furnished by the Ministry of Agriculture.

FISH AND GAME CONSERVATION

Over 60 per cent of the energy in the Iranian diet is contributed by food grains, whereas meat and fish add less than four per cent. Since the total food energy per person per day is less than 2,000 calories, it should be desirable to increase the total food supply per person as well as the amount of protein. An increase in the supply of fish would contribute to both objectives. The Caspian Sea and the Persian Gulf should be fully utilized as sources of needed food for the nation. The inland lakes and rivers also should receive consideration.

Conflicting reports are available relative to the amount of fish that can be secured from the Persian Gulf. It is certain, however, that the quantity now being removed is quite small. Fishermen at Bushire reported their catch to be meager in proportion to the time spent at fishing. The boats and nets in use are quite small and primitive in design. An Iranian report summarizes the situation as follows: "I saw hundreds of Iranian fishermen who were leading a poor and hard life", and "The Bandar Abbass Canning Factory, which once processed 5 to 6 tons of fish daily, now yields only 20 tons of canned fish a year. The factory worked at a loss after Shahrivar 1320 and closed down in 1327."

Trained personnel were not available in connection with the present study for a careful analysis of the fish resources of Iran, but it is apparent that such a study needs to be made during the first years of the Seven Year Plan.

Attention should be given to the question of hunting game birds and animals so that this natural resource may contribute the maximum to the national economy. Research should be done which will lead to regulations to increase the supply of game animals through conservation, breeding and game management.

Recommendations

The following recommendations should lead to an increase in the food supply of the people and to a larger national income:

1. Create in the Plan Organization a division of natural resources to conduct research which will lead to the conservation and efficient use of fish and game birds and animals. At an appropriate time, this work may be transferred to a permanent organization of the Government. An investigation of the possibilities of pearl fishing in the Persian Gulf may be added to the duties of this division if it seems desirable.

2. Provide needed personnel for the research organization as follows:
   - Director (Iranian)
   - Foreign adviser who is trained in ichthyology
   - Foreign adviser with experience in commercial fishing (to be added after completion of initial research)
   - Specialist in game management (Iranian)
   - Six technical assistants (Iranian).
3. Provide sufficient funds for equipment needed in the initial research period.
4. Set aside funds to be available in the later years of the program (if needed) for the development of improved commercial methods.
5. The research should include the following points:
   - The potential supply of fish in Caspian Sea, Persian Gulf, and inland lakes and rivers
   - Modern methods for catching fish
   - Processing, packing and transportation of fish for domestic and foreign markets
   - Need for improving rivers in which the fish spawn
   - Methods of game conservation and propagation as well as needed hunting regulations.

STANDARDIZATION SERVICE FOR FARM PRODUCTS

Iranian agriculture, as well as the public which uses and consumes the raw materials, would benefit greatly from an adequate standarization service for farm products. Sound grading and classing standards tend to improve the quality of products marketed which increases the marketing outlets while bringing larger returns to producers and more satisfaction to consumers.

The following list of crop and livestock products includes those for which marketing standards should be developed during the period of the Seven Year Plan:

Grain Crops: Rice, wheat, barley
Fiber Crops: Cotton, jute, silk
Special Crops: Tobacco
Oil-seed Crops: Flaxseed, cottonseed, sesame
Animal Fibers: Wool, goat hair and wool
Meat Products: Beef, mutton
Fruit Crops: Deciduous tree fruits, citrus fruits, dates, raisins, dried apricots
Nut Crops: Almonds, pistachios
Dairy Products: Milk, butter, cheese

The services which should be developed from this project do not include an inspection service for meat and milk and their products which should be handled by a special organization in the Ministry of Agriculture.

This project should be established as a basic study of marketing needs, facilities, and practices. From such a study enabling legislation should be passed at a later date to set up a Government standardization service within the Ministry of Agriculture. At least three foreign specialists would be needed to make this study. One should be experienced in the marketing problems of field crops, one in horticultural crops, and one in livestock products. The project should be correlated with similar studies being proposed in the distribution section (Vol. V).

The specialists should work closely with the personnel in agricultural economics in the Research and Extension Institute and also with representatives of the Ministry of Agriculture. It should be emphasized that the objective is to develop a system based on Iranian needs—not simply to superimpose on Iran a foreign system, no matter how well it may work elsewhere. Office space for personnel should be furnished by the Ministry of Agriculture.

SOIL AND WATER SURVEY

There is, in Iran, a very serious lack of basic information about two of the fundamental factors in crop production, namely, the soils and the waters being used for irrigation. This situation is particularly dangerous because it is possible to render soils totally unfit for crop growth through the chemical composition of the water with which they are irrigated.

If new lands are to be brought under cultivation with new sources of water from storage reservoirs, there should be available first the basic information about the nature of the soils and of the water with which they will be irrigated.

Soil and water surveys and a system of land classification are urgently needed for purposes such as the following:

The development of new lands
To maintain the productivity of old lands
For the reclamation of abandoned lands
To furnish information which will help in solving problems of fertilization
For the development of policies of proper land use and management.

Recommendations

We recommend that a careful study of the plan proposed by the Provisional Planning Board for establishment of a soil survey be made at a very early date by the advisory board of the proposed Agricultural Research and Extension Institute. It seems probable that a nationwide soil and water survey service should be established in the Ministry of Agriculture as the above report suggests. The importance of such a project is so fundamental and so great, however, that it would seem desirable to employ the services of the foreign technical soils specialists to be brought in for the agricultural experiment stations to help the technicians in the Ministry of Agriculture to plan and develop it.

When formed, the organization's scope should be broad enough to furnish sound, fundamental information on such points as the following:

The origin and formation of Iranian soils

The classification and identification of soils of Iran based on: climatic groups, textural and structural groups, depth to water table, and salinity conditions

The chemical nature of the waters of Iran: surface waters, underground waters.

In addition to and growing out of the fundamental studies outlined above, there should be a soil survey and mapping service developed. That branch of the service would conduct the field surveys and prepare maps to cover the various geographic areas of Iran. Such maps, together with non-technical discussions of the existing conditions, would prove to be invaluable to agriculturists generally and especially to workers in research, teaching and extension.

Another service that should be developed as a part of the laboratory facilities needed for the soil and water resources study is one to perform detailed analyses of soil and water samples for the general public. Information will be wanted from time to time about specific soils or waters to guide extension service personnel in various types of crop demonstrations. There should be eventually a branch laboratory and office set up at each of the main ostan stations to work co-operatively with the Research and Extension Institute, but to be directed and financed by the central soil and water resources service in the Ministry. Equipment should be made available to run both chemical and physical analyses of soil samples and chemical analyses of waters. As a rule, it will be found advisable to have samples taken by the extension personnel so that certain helpful information about each sample can be supplied to the analysts.

If such a soil and water resources service be established at an early date, it will soon prove to be of great help to the program of increasing crop production in Iran.

It is assumed that central office and laboratory space will be supplied by the Ministry. For the work in the provinces, both office and laboratory space should be made available at the ostan stations for the resident personnel who would be employed on this project. It should be anticipated also that when field survey work is undertaken, the working groups should be afforded some office and laboratory space at the ostan stations.

The salary estimate covers only the three administrative officers in the central office, ten foreign specialists to have charge of the field survey work, and stenographic assistance for the various offices. Other field and laboratory personnel should be supplied and paid by the Ministry of Agriculture.

FRUIT PROCESSING, DRYING AND PACKING

Large quantities of fruits and nuts are grown in Iran with Azarbaijan, Fars, Khorassan, Kermanshah and Mazandaran being important centers of production. The deciduous fruits grown are primarily grapes, apricots, apples, cherries, plums, peaches, pomegranates, together with sizeable quantities of citrus fruits and dates. Almonds are the most commonly grown nut crop with pistachios also important.

A large part of the deciduous fruit crop, wisely enough, has been marketed in a dried form. Unfortunately, under present conditions, much of the fruit crop has been wasted due to inadequate on-the-farm processing and drying equipment. Further losses have resulted from a lack of modern equipment for final processing of dried fruits and for grading and packing of both dried fruits and nuts. Citrus and pomegranates have been wasted and lost for want of "juicing" plants, grading and packing. The date crop has not been well marketed due to unsatisfactory processing and packing.

The principal needs of the industry are for funds with which to purchase and install the types of equipment needed and for a limited amount of technical personnel to direct the installation work. Also needed, of course, is an educational program to train the growers in the use of the equipment and to initiate the grading and packing services.

We recommend that Seven Year Plan funds be used to develop this program. For example, in processing raisins and some other dried fruits, lye-dipping tanks, sulphuring houses, drying trays and certain other equipment and expendable materials are needed for proper handling of the fruit before it leaves the orchards and vineyards. Juicing plants should be built and equipped to handle the surplus or lower grades of citrus and pomegranates. Grading and packing plants should be installed for both of those fruits. To increase the marketable date crop there should be adequate processing, grading, packaging and packing facilities. An organization should be set up by means of which funds for such capital expenditures and operating costs could be secured through the Plan.

Funds could be loaned to individual growers or to organized groups of growers on a three-to-five-year basis for the purchase of materials to use in building or buying the various types of equipment and plants needed, such as building the dipping tanks and sulphuring houses for the deciduous fruits, and buying or building the small trucks and tracks needed for moving the fruit around during processing. A great many drying trays will be needed for those fruits also if the present unsanitary and unsatisfactory method of drying directly on the ground is to be stopped. If Plan funds could be used for purchasing the necessary lumber and nails, the growers could be expected to build the trays themselves.

It is estimated that more than 100,000 tons of grapes alone are available for drying each year, just in Azarbaijan. If the other fruits and other areas of production are added, the potential amount would be much greater. About ten trays are needed to dry each ton of grapes, thus more than one million trays should be available in Azarbaijan alone.

At least 1,000 lye-dipping tanks will be needed (each to handle 120 tons of grapes in a 40-day season), during the early years of the program. That number of tanks could supply enough fruit to require some 2,500 sulphuring houses. Expendable materials such as lye and sublimated sulphur would be needed to an extent of approximately 50 and 110 tons, respectively, each year.

Modern equipment should be purchased from foreign sources to use in establishing the citrus and pomegranate juicing plants. Grading and packing sheds for the unprocessed fruit of those two crops should be built adjacent to the juicing plants. Date processing, packaging and packing plants sufficient in size and numbers should be constructed at central points in the producing areas.

We recommended that this problem be referred for study and immediate action at a very early date to the specialists in horticulture to be secured for the Agricultural Research and Extension Institute. This specialist should be named as chairman of a committee comprised of at least one ostan specialist in horticulture, one in agricultural economics marketing, one representative of the Plan Organization, and one representative of the Minister of Agriculture. The committee should be advisory to the fruit processing, drying and packing project.

In the producing areas the extension agents should organize growers, individually or in groups, to make applications to the advisory committee for loans with which to purchase the necessary equipment and supplies. The agents would be expected to pass on the needs, qualifications and reliabilty of the various applicants. Also, they would provide growers with working plans, to be drawn up by the agricultural engineering department of the Institute, to guide them in building the equipment or constructing the buildings.

No additional personnel should be necesary to get this project organized and started. As it develops, it may be found necessary to employ one person, to be responsible to the Plan through the Institute, to administer and execute the program.

Plans have been recommended in the industry and mines section (Vol. IV) for construction of a limited number of plants for final processing, grading and packing of the dried fruit and nut products. Those plans should be developed as rapidly as possible with the ultimate aim of having a plant available in each of the important producing centers.

If adequate on-the-farm processing is combined with suitable plants where final processing, grading and packing can be done, it should add materially to the income from the Iranian fruit and nut crops.

BUDGET FOR AGRICULTURAL PROJECTS

FUNDS AVAILABLE

Chapter I of the Plan Act allocates a sum of Rls. 5,250,000,000 for agricultural and irrigation activities for the seven year period.

The projects proposed in this section should have available Rls. 3,280,634,000 for the seven years as indicated by the following calculation:

Total allocated in Chapter I of the Plan Act		Rls. 5,250,000,000
Items covered outside the agricultural section:		
Agricultural statistics	Rls. 42,633,000	
Meteorology	36,733,000	
Aerial survey	40,000,000	
Irrigation	1,850,000,000	
Total		1,969,366,000
Remainder to cover projects in agricultural section		Rls. 3,280,634,000

SUGGESTED ALLOCATION

Exhibit C-12 presents the recommended allocation of funds for the projects described in this section of the report. With so many unpredictable variables in the situation it is impossible to know the exact allocation of funds for the seven year period. For that reason, and to provide flexilibity, the budget was divided into only four sections.

It should be noted that all of the proposals of the agricultural section of the Provisional Planning Board have been included, although the original outline has not been followed.

Funds for the "bank" to provide loans for the development of special crops, for participation in the capital of co-operative societies and to provide agricultural tools and chemical fertilizers are indicated under "Agricultural Credit".

We believe that the sums allocated are sufficient to carry out the work described and that, if the projects are efficiently executed, the agricultural production of Iran will be materially increased and the level of living of the peasants improved.

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WATER RESOURCES

INTRODUCTION

When carrying out an appraisal of the possibilities of conservation and use of a country's water resources it is not possible to distinguish rigidly between water use and land use. Although water is an indispensable commodity for life, man's needs, for direct consumption only, form but a negligible proportion of his total requirements. It is in combination with land that water exerts its controlling interest in the destinies of the human race. The correct combination, in space and time, of water and land, is the basis of agriculture, which was the source and is the mainstay of community life. Water gives value to the land, and on our present knowledge the two in combination are the final measure of the population-carrying capacity of the earth: they are primary natural resources.

The studies relating to agricultural land use policies are covered in the preceding section of our report, under agriculture, and it is not necessary to enlarge here on the agricultural situation in Iran except to mention that it is necessary to read this section of the report in conjunction with that dealing with agriculture, and to give the following brief outline of the reasons why Iran is, or should be, vitally interested in the early formulation of the comprehensive water-land use policy leading to the conservation and better use of these primary natural resources:

1. The high percentage of the population which is occupied with agricultural pursuits, and whose standards of living are consequently dependent on agricultural production.
2. The desirability of increasing exports of agricultural produce to gain foreign exchange.
3. The necessity of being agriculturally self-sufficient, not only to conserve foreign exchange but also to save the high transportation costs involved in importation and distribution.

In Iran the situation has by no means developed where there is insufficient land for the people. The overall land area has been estimated at some 164,000,000 hectares of which ten per cent is classed as crop land. Only a quarter of this crop land is under actual cultivation in a given year, the remainder lying fallow. It is estimated that a further 20 per cent of the total area is potentially cultivable. Pasture and forest lands are estimated to occupy 20 per cent of the total area, and it may be possible to increase this figure to 30 per cent. The remainder, not less than 30 per cent of the total area, is classed as uncultivable mountain or desert areas, incapable of supporting life.

Concerning soil quality, unfortunately there has been a total lack of detailed and extensive soil studies, but recent observers have recorded that the soils in Iran are generally fertile, and that carefully-controlled experiments may result in better yields being obtained.

If it is accepted that there is a need for agricultural expansion and that land of quality is available in quantity, it follows that one of the major limiting factors to development is water, or rather irrigation water. From available statistics it appears that over 65 per cent of the land at present cultivated depends on rainfall alone. This means that the agricultural economy is mainly tied to winter crops, which are often the least

profitable from the point of view of both cash returns and maintenance of soil fertility. Such a policy means that good rotation practice cannot be followed and the benefits of mixed farming are lost.

It was irrigation that gave to Egypt and to the Sudan a cotton industry. It was irrigation on a very large scale that gave India a stable agricultural economy. The former Government of India spent in excess of 12,000,000,000 rials equivalent on irrigation works, the area commanded by irrigation in Pakistan and India exceeds 13,500,000 hectares, and the annual gross value of the resulting crops is over 9,000,000,000 rials equivalent. In Iraq, the area under irrigation is between 500,000 and 700,000 hectares, and it is significant that 75 per cent of the wheat and barley grown on all land in Iraq is produced by irrigation.

The first approach to the problems connected with conservation and use of water resources must therefore be an appraisal of the water available for use, which amounts to the preparation of a water balance sheet for the country.

EVALUATION OF WATER RESOURCES

The total annual intake or replenishment of water is almost entirely dependent on precipitation: rain and snowfall. Thus, unlike in Egypt, for instance, relatively small quantities of water are imported by surface streams. There are in fact only two cases of rivers entering Iranian territory in appreciable quantities, namely the Hirmand and Hari Rud. The former crosses the Afghanistan frontier near Sistan and supplies the fertile Sistan basin, an area of some 2,300 sq km, with an estimated population density of the order of 16 per sq km. The Hari Rud enters the country just south of Agha Toman and flows north forming the border between Iran and Afghanistan and then between Iran and U.S.S.R., finally leaving Iranian territory just north of Sarakhs.

It is fairly certain that no appreciable water quantities enter Iran by means of underground channels, although this matter should be investigated further since geological surveys may reveal some contribution from across the Afghan frontier.

PRECIPITATION

Iran may be divided broadly into three major weather regions: (1) northwestern Iran and south Caspian littoral, (2) the mountain ranges and the plateau south and east of the Elborz Range, and (3) the southern plains and Persian Gulf area.

The southern Caspian area is sheltered from the larger influences arising from the general pressure distribution and the result is that in the southern part of the sea local winds and local weather are outstanding in their diversity, and the amount of rainfall and its distribution throughout the year varies greatly over the region. On the western and southwestern Caspian coast the greatest rainfall occurs in Shahrivar (September), and on the southeast coast, where the rainfall is only a small fraction of that on the southwest coast, the months of greatest precipitation are Dey and Esfand (January and March). Snow precipitation occurs generally above 1,500 meters altitude with snow cover lasting for about two weeks on the lower ground and for about six months at altitudes above 2,000 meters.

Practically all the precipitation of western Iran falls during the period Aban to Ordibehesht (November to May) inclusive, with Esfand (March) the wettest month and

Dey (January) the next wettest, and is derived either from winter Mediterranean depressions or in the form of showers from unstable clouds. The most persistent falls, though not necessarily the heaviest, are experienced with a south to north air flow from a secondary depression in the Basra area. The topography of the country is the chief factor in determining the distribution of rainfall, and as precipitation comes from the west or south, places near the west or south edge of the mountain mass receive the earliest and also the largest amounts. By the time eastward moving fronts and moist air streams reach Tehran and Arak they have been dried out considerably.

The magnitude of the orographic effects is shown in the case of Ghum. This place, though generally in the same air stream as Arak and Tehran, has on the average less rainfall than either, only about 100 mm. Ghum lies on a plain with no mountain ranges nearby to give orographic uplift to produce rain or snow.

Snowfalls which occur above 1,000 meters altitude are usually confined to the period Azar to Esfand (December to March), and snow cover may last for six months. Precipitation fades out to practically zero over the desert wastes towards the Afghan frontier, and in the Kavir areas it is estimated that annual precipitation may be less than 50 mm per annum.

Over the greater part of the southwest plains and Persian Gulf area the climate is of the "desert" type. The small and variable amount of rainfall depends largely on the configuration of the land, the places with heaviest falls are among the hills. Practically all the rainfall occurs in the winter half year, Aban to Farvardin (November to April), and is associated with disturbances which move from the eastern Mediterranean to the head of the Persian Gulf area with accompanying fronts. The precipitation is sometimes very heavy, especially when there is thunder, but whatever its intensity it does not usually last for more than twelve hours. In the Makran area there may be less than 70 mm of rain in any year for two or three consecutive years, and any month may be rainless. The monsoon does not seriously affect precipitation in Iran, although it may bring a small amount of rain for about two days in Tir (July).

With a view to making an assessment of the average annual intake of water, approximate lines of equal precipitation have been drawn for Iran as shown in Exhibit D-1, using such data as are at present available and having regard to the general meteorological and topographical influencing factors. It is important to stress that the map indicates only average conditions, and the following factors must be taken into account when interpreting it:

1. There is the nature of precipitation to consider, i. e. its incidence with regard to time. Exhibit D-2 illustrates the mean monthly distribution of rainfall for various selected localities.

2. There is the question of reliability of precipitation. Few of the existing weather stations have sufficiently long-range records suitable for use in illustrating the extreme variability of annual precipitation over all Iran. We have selected three stations: Tehran, Shiraz, and Bushire, with sufficiently long-range records for the purpose of showing this variation.

   Exhibit D-3 shows the annual rainfall records for these localities over the period 1279-1326 (1900-1947). From these curves Exhibit D-4 has been prepared to show the annual duration of rainfall, or variation from the mean. In order to draw attention to the recurring droughts we have also prepared Exhibit D-5, showing Bushire rainfall over the period 1269 to 1309 (1890-1930).

From Exhibit D-3 we note that for Bushire the total range of deviation from the mean for the period was of the order of 240 per cent, having been 160 per cent above the mean in 1273 and 80 per cent below the mean in 1301. Similar characteristics are revealed for Tehran and Shiraz, while Exhibit D-5 brings out clearly the tendency for the occurrence of consecutive years of drought. Thus over the period 1280-1287 all but one were drought years. From Exhibit D-4 we deduce that over a long period average precipitation would occur for between 40 and 50 per cent of the time only.

It is evident, therefore, that not only is Iran subject to a most uneven distribution of rainfall, but also to wide fluctuations from year to year. This divergent and unreliable characteristic of rainfall is of special significance to a country essentially dependent on home production for its requirements of food, and where such production is in turn almost entirely dependent on natural precipitation.

Owing to the lack of large rivers in Iran there has always been a tendency for irrigation to be piecemeal and local, and it is only in Khuzistan, watered by the Karun and Karkheh Rivers, that there was, in ancient times, an extensive system of canals dependent on barrages. Today, irrigation is almost entirely dependent upon kanats (the most important), wells, and direct flow channels from rivers.

The urgent need for irrigation is manifest. Indeed the fact that over most of Iran the precipitation is insufficient to mature summer crops and, over large areas in the central plateau, southern and eastern regions, is barely sufficient to mature winter crops has left its mark not only in the continued existence of nomadic tribes but also in the localization of the bulk of the population in the regions of comparatively high rainfall. This can be seen from Exhibit D-6, which shows an estimated population distribution for the country.

SNOW STORAGE

It is estimated that the lasting snow area, which may be taken as the area lying above the 2,000-meter contour, amounts to some 280,000 sq km as shown in Exhibit D-7. By using the precipitation chart, Exhibit D-1, it is estimated that the average contribution to total precipitation annually made by the mountain areas amounts to about 30 per cent.

A high proportion of this percentage is in the form of snow. Snow storage is valuable to Iran for the following reasons:

1. The water content remains in iced storage at high altitudes over a time of year when evaporation rates are low, and loss of water is therefore avoided.
2. The most important effect is felt, however, in that the flows of the rivers fed by snow are prolonged far into the summer, and that flood peaks are reduced.

   Exhibit D-8 illustrates how the snowfall which accumulated in the Kuhrang Valley over the period Dey - Farvardin (January - April), appears as run-off over the period Ordibehesht - Mordad (May - July).
3. Due to the reduced ratio of maximum to average discharge of snowfed rivers, the silt content of the river waters, at least in the upper reaches, is usually much less than that for rivers which are rain fed.

Although the fact that so much of the precipitation is in the form of snow retards the run-off, it is still of a seasonal character, as will be seen later when typical river hydrographs are discussed, and it is of vital importance in the interests of water conservation that the absorptive capacity of the terrain in the upper catchment areas should be increased, and the rate of flow-off thus diminished and distributed more evenly throughout the year.

REFORESTATION AND CONSERVATION OF RESOURCES

Reforestation of the upper catchment areas would go far towards the achievement of these aims. In the first place it will assist in binding the soil and therefore improve its "sponge" effect or ability to hold water. Secondly, it will increase the effectiveness of the snow storage. But the most important result of reforestation lies in its capacity to diminish soil erosion and thus to prevent, or at least reduce, siltation of reservoirs. The importance of this latter consideration may be illustrated by the fact that there have been instances, in South Africa, the United States and elsewhere, of reservoirs completely silting up within a few years of construction, resulting in the loss of the whole of the original investment. Similar examples are to be found in Iran itself, in Khorassan, where there is ample evidence of the heavy silting which took place in the ancient irrigation reservoirs.

WATER UTILIZATION: USE AND WASTE

Use Items

The use of water may be arbitrarily classified under the following main headings:

Agriculture and irrigation
Potable and industrial
Navigation.

Agriculture

It has been extremely difficult to obtain reliable data relating to the amount of water used to mature the various crops in Iran, but from the inquiries we made it would appear that, in cases where irrigation is practiced, large amounts of water are used.

The irrigation periods in the Veramin area of Tehran are approximately as follows:

Summer wheat and barley (Seeded March)	Esfand - Tir (March - July)
Winter wheat and barley (Seeded late November)	Aban - Khordad (November - May)
Vegetables (Summer)	Farvardin - Mehr (April - October)
Cotton	Ordibehesht - Mehr (May - October)
Orchards	Khordad - Shahrivar (May - September)

It was noted in both the Veramin and Isfahan areas that, as a result of the seasonal fluctuations of run-of-river diversions, the spring sowing periods are usually staggered over the period of high discharge, April 1-May 15, in order to make the most of the available river water.

The winter crops seem to require six irrigations, and it has been noted locally that if the sowing can be concentrated at the correct time, i. e. correct as regards temperature conditions, instead of spread over a period to utilize available water, the output per hectare for wheat and barley increases noticeably.

The water depths in the Veramin area applied to the field appear to be as follows:

Crops	Meters
Winter barley and wheat	0.50 - 0.70
Summer barley and wheat	0.70 - 0.85
Vegetables	1.25
Cotton	0.80 - 1.30
Orchards	0.80

Considerable variations occur in depths used, depending on individuals, location, and on slope and nature of the ground.

At first sight it would appear as if much wasteful practice is followed, and in some instances, where depths of up to 1.89 meters have been observed for wheat, this is no doubt true. Care must be exercised when planning irrigation schemes in Iran so as not to decrease the applied water depths too much in an endeavor to follow either western practice or practice in other territories where applied water quantities may be low. There are three major features to be borne in mind:

1. Owing to high soil salt content of many irrigation areas, it may be necessary to leach out salts by using extra water.
2. A close study by using "day-degree consumptive use" methods may reveal that, owing to fairly high aggregate temperatures which prevail, the consumptive use of water in Iran may need to be fairly high. Exhibit D-9 shows mean monthly temperatures and mean extreme temperatures for various localities in Iran.
3. It would be erroneous to adopt entirely the irrigation policies of "plains areas" to Iran. Only in Khuzistan and parts of Khorassan would conditions be similar to those prevailing in most of the large-scale irrigation schemes of the world. The irrigation problems of Iran have to be approached in a new light, having full regard for the intermountain nature of the valleys and the greater slopes of terrain.

Potable and Industrial

The amount of water consumed at present under this heading is relatively small. With the exception of Abadan and Ahwaz there are no modern potable water systems in Iran, although it is hoped that Tehran, Shiraz and Meshed will shortly have modern water supply systems under contracts now proceeding.

It is estimated that potable requirements, based on modern water supply systems for all towns with a population in excess of 50,000, and special arrangements for smaller

villages, together with industrial requirements in the next seven years will not exceed 1,000,000,000 cu m per annum.

It must not be assumed, however, that, because the relative amount of water required when compared with agricultural needs is small, the question of potable water supplies is unimportant. On the contrary it is vitally important for Iran, and our detailed comments are given in the section dealing with town improvements and housing which appears later in this volume.

Navigation

The Karun is the only navigable river in Iran, and navigation requirements may, therefore, be estimated on low flow conditions of this river at Ahwaz. These requirements amount to 8,000,000,000 cubic meters per annum.

Gross Water Requirements

It appears that agricultural demands for water constitute over 97 per cent of the total requirements which are estmiated to be of the order of 500,000,000,000 cu m per annum at the end of the Seven-Year Plan period, which figure allows for general storage and transit losses, but not for increase in population.

Waste Items

Percolation or Seepage Losses

It is extremely difficult to estimate loss and waste figures. Apart from short-time discharge measurements recently carried out on the Lar, Karaj, upper Karun and Zayandeh Rivers, and the long-term gauge readings of the Karun at Ahwaz, no hydrological records are available for Iranian rivers.

There is uncertainty as to whether Iran loses water by deep underground channels. This is doubtful, but until mapping of the country has proceeded sufficiently far to enable geologists to study this problem fully, one cannot be certain.

Fresh water springs occur in the Persian Gulf near the Arabian coast, but it cannot be assumed by any means that the Iranian mountains are the source of origin. Deep wells drilled in southern Iran by the Anglo-Iranian Oil Company seem to indicate that there is no appreciable movement of water at great depths.

It is unlikely that there will be losses northwards and eastwards, but there may be some losses westwards, toward the Tigris basin. For the time being, in the absence of reliable evidence, it is assumed that seepage losses are negligible.

Evaporation Losses

As far as we know no evaporation measurements have ever been carried out apart from one season's recordings in the Lar Valley in 1324 (1945); these referred to evaporation from a free water surface.

Evaporation losses and flow-off can therefore only be estimated roughly at present by an indirect approach. If it is accepted that there are no appreciable underground losses it follows that the total precipitation on the basin area must evaporate, whether through plants or uselessly.

Surface Flow-off in Rivers

Exhibit D-10 shows a hydrograph for the Karaj River over the period 1326-1327 (1947-1948) and Exhibit D-8 shows a similar hydrograph for the Karun River at the Kuhrang diversion site for approximately the same period, together with temperature and snow precipitation records. It is noted that the ratio: maximum to average discharge is fairly low for these rivers, of the order of 4:1. In the case of rivers not fed by melting snow the river flow falls to insignificant quantities and may completely disappear during the hot summer months.

In Appendix D-1 we have recorded some silt measurements obtained from three Iranian rivers compared with the silt content of rivers in other parts of the world.

Exhibit D-11 gives the results of chemical analyses of water samples recently carried out by the firm of consulting engineers, Sir Alexander Gibb and Partners. These analyses relate to samples from underground sources as well as from river sources.

Since Iran is flanked by mountain ranges on practically all sides and since climatological disturbances originate from outside the country. it follows that much of her annual precipitation will flow into the external drainage system and, unless harnessed artificially, can be utilized only on a comparatively small area of ground before the water crosses the land frontiers or passes directly into the sea. From Exhibit D-1 it is estimated that on present assumptions about 65 per cent of Iran's total annual water intake falls on such "export areas". The remaining 35 per cent that flows into the country's internal drainage system must ultimately evaporate, with or without having been previously utilized, as there is no outlet to the sea.

The greatest single offender in "exporting" water is the Karun River which, with a catchment area of 59,000 sq kms, exports annually, it is estimated, some 24,000,000,000 cu m past Ahwaz, equivalent to a depth of water of 400 mm over the whole catchment area.

In order to make a general appraisal of the supply and demand for water an attempt has been made to draw up a tentative annual balance sheet. From the limited information available it is calculated that the total average annual intake amounts to some 460,000,000,000 cu m of which 310,000,000,000 cu m are lost annually by surface flow-off and by useless evaporation.

The major conclusion arrived at from a study of the hydro balance sheet is that, apart from the necessity to utilize the waste flow-off river water and the water now evaporating uselessly, it will be necessary to plan for the extensive re-use of water. Return seepage from irrigation schemes at high levels will have to be used again in areas lower down, and the process repeated as often as possible. This will be the only way to balance the budget, especially during the frequent periods of consecutive years of drought already referred to. Strong emphasis is thus placed on the early development of high altitude schemes and on the use of underground water resources. The interception of underground water provides an excellent means of creating "new" water; and, provided effective steps are taken to avoid salt encroachment, this will go a long way by itself towards reducing the deficit. It must, however, be remembered, when planning the extension of underground resources, that water can be withdrawn more rapidly than it can be replaced because every soil has a given rate of replacement and a definite capacity and consequently planning must be on the basis of "sustained yield", otherwise the results will be overdrafts, falling water tables, increasingly costly pumping schemes, and barren lands.

Before giving our general conclusions with regard to the possibilities of conservation and increased use of water it is necessary to record briefly some notes on the present situation in regard to water rights and ownership of land.

PRESENT WATER-LAND USE

There is no detailed information available about types of land tenure and their distribution in Iran. There is a universal recognition of the vital need for water, but the system of water rights is such that it is extremely difficult to finance and amortize an irrigation scheme. In Iran the water value is generally assessed in the same manner as for the greater part of the Middle East: twenty per cent of crop value, this figure being based on the principle of five equal vital factors being involved in crop production. These factors are: man (labor), seed, animal (draught), land and water.

The formula is not universally used, but wherever it is applied the fundamental principle, that water gives value to the remaining four factors, is ignored. The formula makes no allowance for the relationship between water quality and land quality, and it does not make proper allowance for the fact that of all the factors, water quantity is affected considerably by annual weather fluctuations, and that a uniform or regular cubic meter of water has a higher value than a variable or unreliable one.

There are five main types of land ownership:

1. "Khalisa" lands, which are Crown property, usually leased out in large blocks to wealthy persons, who often then sub-let.
2. "Qiul" lands, which are also Crown property, granted in feudal tenure in return for services, e.g. to tribal leaders or to officers of the Court instead of pay.
3. "Milkiat", which is full private ownership in accordance with Islamic law.
4. "Waqf" lands, which are held in trust either for groups of persons or for religious or educational purposes.
5. "Khurdeh Malik", which is the communal ownership of land by the village community.

Most of the cultivated land of Iran is held under the first four types of ownership, but as they favor absentee landlordism, no great progress will be possible with regard to irrigation practice until the system of land tenure and water values has been reformed.

Suggestions relating to land tenure reforms do not come within the scope of this section of the report, but are covered in the legal matters section (Vol. V).

PLANNING AND DEVELOPMENT OF WATER RESOURCES

Reliable statistics are an essential precursor to planning. Our rough estimates have shown that, even in an average year, Iran will shortly be faced with a serious water deficit and that in a series of bad years the position may be disastrous. The very first action, in view of the long-term importance of the matter, must be to take steps to improve the estimates of water resources.

SNOW SURVEYS AND HYDROLOGICAL MEASUREMENTS

In the first place it is essential to know more about the extent and amount of Iran's annual snow precipitation, and observation stations should be installed to cover both the main mountain ranges. The information so obtained would be most useful for forestry purposes.

Regarding the Elborz Range, suitable sites for such survey stations may be found either in the Karaj Valley or in the Lar Valley. For the Zagros Range the best localities for recording stations are probably the Karun-Zayandeh Rud diversion site (Kuhrang scheme), and possibly a site near Hamadan or Kermanshah. Once adequate air survey maps of the country are available it should be possible, in addition to measuring the actual amounts of snow and rain precipitated at these experimental sites, to measure also the area of incidence of snowfall. By the arrangement with the Civil Aviation Department it should be possible to plot snow cover from air reconnaissance flights.

From the point of view of planning the development of all water resources the great need is for measurements of river discharges and it is considered to be necessary to install at least 50 hydrological stations on the various rivers in Iran. These hydrological stations ought to be installed without delay and continuous records should be kept. In many places it will be possible to install automatic recording apparatus, thereby obtaining more reliable records and saving labor. By measuring river discharges the upstream catchment losses due to evaporation and seepage are allowed for automatically, and these records provide most of the data concerning regime behavior of rivers required by the engineer to plan diversion, storage and water control works.

Apparatus should be provided at every hydrological station for gauging silt content of rivers, and periodical chemical analyses should be performed in order to check the seasonal variations in chemical composition of the water.

In order to improve knowledge of loss and waste items, it will be necessary to take measurements also of evaporation rates in all the ostans and to obtain statistics of water consumption for crops in the various ostans.

METEOROLOGY

In addition it is essential to increase the number and the reliability of meteorological records. Meteorological observations, as distinct from hydrological observations, are also of immense interest to the Department of Civil Aviation. As a result of our studies and discussions we have come to the conclusion that there is no satisfactory alternative to the establishment of a single National Meteorological Service, which will be concerned with meteorological observations for both agriculture (water use) and civil aviation (forecasting). Our comments and proposals dealing with meteorology have been set out fully in the section on meteorology in this volume.

For reasons which will be described later we do not recommend that hydrological measurements and snow surveys come under the National Meteorological Service.

MAPPING AND TOPOGRAPHICAL SURVEYS

Iran has never been adequately and reliably mapped. This has seriously delayed engineering progress to date, and until the matter is rectified the orderly development of the country's resources, in accordance with the principles of the maximum benefit to the greatest number, will not be possible. Our comments and recommendations with regard to surveying and mapping have been set out fully in a separate section in this volume.

PROPOSALS FOR A CENTRAL WATER AUTHORITY

No effective large scale measures will be possible with regard to the conservation of Iran's water resources until it is recognized that water is a national asset which will determine the entire agricultural economy of the country. No major engineering schemes will be possible unless the value of water can be assessed, because in the absence of such values it is not possible to calculate the manner and times of amortization of schemes.

Our recommendation is, therefore, that there should be appointed on behalf of the nation a trustee of all water resources of the country in the form of a Central Water Authority, and this Authority (CWA) should be accountable to the nation for the manner in which the water resources are exploited.

We have, therefore, drawn up proposals for the establishment of such an Authority, full details of which will be found in Appendix D-2.

The following is a brief summary of the principal tasks proposed:

1. The survey of the water resources of Iran and the collection and publication of all statistics.
2. The planning, supervision of execution, and management of all irrigation schemes.
3. The granting of licenses for the development of hydro-electric power.
4. Technical assistance in connection with water supply schemes for local authorities and municipalities.
5. The setting up of a survey department responsible for the production of all maps.

We consider it essential that the CWA should be given statutory powers to acquire water rights, land and any other rights incidental to the conservation and use of water. It is essential that there should be a close interrelationship and co-operation between the CWA, the Ministry of Agriculture and the organization responsible for electric power production.

While we wish to stress the need for a centralized agency the importance of de-centralizing work and authority to carry it out will be readily appreciated for a country as large as Iran. We accordingly propose that the whole country should be divided up into a number of "water districts", the manager at the head of each of which should be a thoroughly qualified and experienced engineer.

We would stress that there is no need to create a new authority; it is merely necessary to expand and re-organize the existing Independent Irrigation Corporation. The scope and activities of this corporation, which came into being in 1322 (1943), is at

present controlled by the size of its budget, which was fixed as Rls. 45,000,000 per annum for the ten year period 1322-1332.

In the short period of its existence this young and active corporation has made great efforts to deal with its numerous problems, and it has done much to establish its prestige and to further the practice of irrigation. Its main handicaps are:

Lack of funds
Lack of reliable statistics
Insufficient statutory powers
The existing complicated system of land tenure and of water rights.

The reasons why we recommend that hydrological and snow surveys should not come under the National Meteorological Service are now apparent. Such survey work is so intimately bound up with the planning and development of water resources that it is essential for the CWA to have control of this work.

TECHNICAL EDUCATION AND TRAINING

The execution of the schemes of development approved under the Seven Year Plan will make a heavy demand upon the technical man-power of the country. The general subject of education is dealt with fully in a separate report, but here it is necessary to refer briefly to the special steps which will have to be taken to provide opportunities for the acquisition of training and experience for those who will ultimately become responsible for organizing both planning and execution at the higher levels.

A basic technical education will be provided by the existing university and technical institutions. Students will follow the normal curriculum for a degree course.

Such institutions, expanded as may be necessary to meet the needs for higher education, will provide the great mass of the engineering and scientific staffs necessary to carry out development work. For some years to come post-graduate and specialized training will have to be obtained at foreign universities, to which selected graduates will be sent for periods varying from one to two and one-half years to obtain a master's or doctor's degree.

It will be the duty of the CWA to prepare forecasts of technical man-power requirements for a period of at least three years ahead, and to select suitable graduates for foreign training. On return to Iran the post-graduate engineer will be employed by the authority which sponsored his training (CWA) to which an undertaking will have been previously given to engage his services for a minimum period of two years.

But apart from the purely academic and scientific training to be obtained in this way, it is most important that arrangements should be made to provide practical experience in the execution and management of important engineering works. Personnel most likely to benefit from such opportunities are those who in addition to possessing the normal academic qualifications have had a number of years experience in the design and construction of works in Iran. For this purpose selected engineers will be given special leave of absence from their departmental duties and will be sent abroad for periods varying from six months to two years, to work in the laboratories, in the design

offices, on construction of works and on operation of actual undertakings either with private manufacturing firms, consulting engineers, or with public authorities or government agencies.

The object of these study courses will be to afford practical experience in the design, construction and administration of engineering enterprises. The fields in which it is most essential for the engineering staff of the CWA to secure experience, would include the following:

Experimental hydraulics
River gauging and silt measurements
Planning and design of irrigation systems
River training and flood control schemes
Design of dams and other hydraulic structures
Engineering economics
Modern surveying methods—including the principles of aerial surveying
Modern construction methods and the organization of construction projects
Engineering geology
Engineering specifications
Principles of water power engineering
Design of water supply schemes for cities
Methods of water treatment and bacteriological control
Sewage disposal
Land drainage
Ground water survey methods
Modern methods of geological boring and well sinking
Control of soil erosion.

Operating and administrative experience should be sought in the following fields:

Irrigation schemes, particularly in those countries such as India, Pakistan, Egypt and the Sudan, where problems to be met resemble those in Iran

Water supply and distribution schemes affording potable supplies to both urban and rural communities.

The experience gained should cover such matters as maintenance, methods of assessing and charging for water, collection of revenue, general administration and management.

BUILDING AND CIVIL ENGINEERING POTENTIAL AND LABOR

The capacity of Iranian contractors and labor conditions combine to form a serious factor of influence with which the Plan, and particularly a program of dam construction and water supplies, can be implemented.

It is abundantly clear that care will have to be exercised to integrate the Seven Year Plan works with the economy of the whole country; that the personnel of the Plan

Organization concerned with building and civil engineering works will have to be fully organized to meet the new demands superimposed on top of normal present requirements; that early stress will have to be placed on the necessity for the establishment and maintenance of standards of workmanship and of quality of materials, which means that codes of practice and a system of specifications must be introduced; and finally, that the labor pool should be steadily increased and that the training and supply of skilled workers should be foreseen at high levels and regulated to meet the growing needs of the whole country.

Finally, it is appropriate to stress that in no circumstances must the general outlook be confined to what amounts to a "contract period of seven years". Such an outlook would result in chaos at the end of the Plan period. The seven years should be regarded as an introduction to a period of continuous expansion of efforts; and planning, particularly budgeting, should be directed towards continuity at the end of the term of the Plan.

CONCLUSIONS WITH REGARD TO WATER CONSERVATION METHODS

Our conclusions, as a result of the study of Iran's water resources described previously, are as follows:

1. Having regard to the water available and to the needs of the country, there is a considerable amount of water available to be harnessed for use which is at present wasted by surface run-off and by useless evaporation.
2. The only effective way to introduce a stable agricultural economy and to overcome the effects of the wide climatological fluctuations which are a feature of the country is by a progressive increase in the practice of irrigation.
3. The best use will be made of available resources if planning is on the basis that the maximum use is to be made of water resources provided irrigation needs are not compromised unduly.
4. Having regard to the ultimate needs of the country, the water resources available will be sufficient for a foreseeable period only if planning is carried out in accordance with the principle of maximum re-use of water.
5. The reduction of loss and waste can be achieved by the following methods:
   a. Reforestation of headwater areas of catchments.
   b. The introduction of better irrigation methods and of enlightened water-land-use policies and laws.
   c. Diversion to inland basins and storage of surface waste waters.
   d. The interception of underground waters and skillful replenishment of this source of supply.

With regard to 5a, the question of reforestation has been fully dealt with elsewhere in this report. Under this heading it is merely necessary to mention that a proportion of water now lost by useless evaporation will, after reforestation, evaporate usefully.

The question of water conservation by the practice of better irrigation methods is a matter of agricultural education, and is dealt with in the agricultural section of our report. We are convinced that the introduction of enlightened water-land use policies

and laws will not be an easy matter, but the process will be greatly helped by the establishment of a Central Water Authority to act as the nation's trustee of water resources, as previously described and as detailed in Appendix D-2.

DIVERSION AND STORAGE OF SURFACE WASTE WATERS

General

Opportunities for developing surface water supplies are greatest in the case of those rivers which have their sources in the high mountain ranges flanking the country on the north, west and southwest where the precipitation in the form of rain and snow is relatively high.

Development will lie in two directions:

1. Conservation of the spring floods by the construction of storage reservoirs on the upper reaches of the rivers wherever suitable sites can be found.
2. The diversion into the interior of the country of the head streams of rivers which now drain outwards from the perimeter mountains and discharge either across the frontiers of Iran or directly into the surrounding seas.

The latter method will be found practicable in some cases where the total run-off from the outward flowing rivers is in excess of the requirements of the border lands through which they flow. Two cases of this sort have already been studied, the River Lar and the River Karun and are referred to later in greater detail.

In planning the conservation of surface water supplies it is of the utmost importance to view the development of a river basin as a whole. In the majority of cases the control of the annual run-off will be effected by constructing a series of reservoirs both on the main stream and on its principal effluents. Although these reservoirs will be constructed independently and over a period of years, they should be regarded as integral parts of an over-all scheme for developing the resources of the river system and it is, therefore, necessary to consider the ultimate development when planning the construction of an individual reservoir.

Such over-all planning must be based upon adequate maps and upon a detailed knowledge of the characteristics of the individual streams which make up the whole. The thorough study of these characteristics will take many years, and although it will not be necessary to postpone development work until it has been completed, it would be unwise to embark upon a scheme of heavy capital expenditure before reliable information has been accumulated.

Importance of Silt

The barren and treeless character of the country leads to heavy soil erosion of the mountain slopes with the result that when in flood the rivers carry a great deal of silt in suspension. The construction of a dam across the river valley will cause the deposition within the reservoir area of nearly the whole of the silt carried in suspension, and if the storage capacity is not great in relation to the total annual discharge of the river the reservoir may, in unfavorable circumstances, become completely filled up and rendered useless in a very few years.

Since Iranian rivers are in general characterized by a heavy silt load it is of vital importance that the effect of this load on the useful life of a reservoir should be very carefully studied before detailed plans are prepared. Silt, once it has been deposited in a reservoir, cannot be removed except at prohibitive cost.

Another important factor in the construction of dams on heavily silt-laden rivers is the increased eroding power conferred upon the water after it has deposited its silt in the reservoir. The clear water released from the dam will tend to erode an alluvial river bed more rapidly than it would do if it had continued to carry its normal silt burden, and the possibility of such increased erosion should not be ignored when considering the effect upon the regime of the river of constructing impounding reservoirs.

Unfortunately there are not many data available relating to silt content of Iranian rivers. We have given in Appendix D-1 such information as is available, and have added relevant data relating to rivers in other parts of the world in order to effect a comparison.

Types of Dams and Methods of Construction

The selection of the most suitable type of dam will depend upon two principal factors: the physical characteristics of the site and availability of the materials of construction. Among the more common types of dam may be mentioned the following:

1. Concrete or masonry gravity dams built either in lime mortar or portland cement concrete.
2. Horizontal arch dams in portland cement concrete.
3. Special types of hollow or buttress gravity dams built in portland cement concrete without the use of steel reinforcement.
4. Special types of reinforced concrete dams such as the multiple arch and thin slab and buttress.
5. Earth and rock fill dams.

No decision with regard to the most suitable type, in any given circumstances, can be taken until a detailed study of the geological structure of the site has been made. Such studies will include the sinking of trial pits where the underlying rock is at no great depth below the surface, together with trial bores for the purpose of determining the character of the rock in depth. The geological studies of the site of a proposed dam should be extended to cover the reservoir basin as a whole, since expenditure upon an otherwise satisfactory dam may be wasted should it afterwards be found that serious leakage is taking place through the rocks which form the floor and sides of the reservoir. Thorough geological studies are somewhat slow and costly, but the temptation to treat them lightly must be resisted since the time and money spent will be repaid many times in the savings rendered possible in the cost of the completed work.

Another very important factor which influences the selection of the type of dam is the maximum flood for which provision is to be made. The size of the flood affects not only the design of the spillway and the dam itself, but the whole planning of the construction program.

In addition to the factors mentioned, the choice of type will be greatly influenced by the availability and cost of the materials of construction. Rubble masonry set in lime mortar has been used for dam construction in Iran since ancient times. While it is still

useful, in certain circumstances, the constrction of dams in lime mortar is very slow and for this reason its use, in recent years, has been almost entirely superseded by portland cement. Although the latter material is manufactured in Tehran, the capacity of the existing cement works is far below the requirements of the country and considerable quantities have to be imported from abroad. Apart from this, portland cement is expensive in Iran, particularly when the cost of the long transportation hauls is taken into account.

We have given our recommendations on a cement manufacturing program in the industrial and mining section of our report (Vol. IV). When this program is implemented both the quantity and the quality of cement will improve considerably and it is hoped that prices will be reduced materially. This will be achieved in part by locating cement plants in or near the principal demand centers. It is anticipated that the effects of this program will not be felt until towards the end of the fourth year, and in the meantime it will be desirable to select designs which will reduce the use of cement to a minimum.

Except in special cases, we are not inclined to recommend the adoption of hollow types of dams involving the use of considerable steel reinforcement. The latter is expensive and difficult to obtain, in addition to which the designs for such dams are usually relatively complicated and the permanence of the finished structure is very much dependent on the quality of workmanship and the effectiveness of the supervision which has been exercised during construction.

Where site conditions are suitable, the use of horizontal arch dams will lead to considerable economy in material as compared with a normal gravity dam, but where unfavorable for a horizontal arch, economy in the use of cement can be secured by the adoption of the heavy buttress type of dam, in which the use of steel reinforcement is entirely avoided.

In many cases, however, we believe that the most economical type of structure will be found in the adoption of a rock-filled type of dam embodying either a core of impervious material or a reinforced concrete diaphragm.

Review of Projected Schemes

The construction of reservoirs has formed the subject of intensive study by the Independent Irrigation Corporation since it was first established by an act of the Majless in 1322 (1943). As a result of its efforts a considerable number of projects have been proposed, some of which have already been started. We have visited the sites of most of these projects and in Appendix D-3 will be found a general description of them, together with our comments, based upon a study of the available reports and the information provided by the Irrigation Corporation.

In general these projects fall into three classes:

1. Proposals submitted by the Irrigation Corporation for the re-construction of old irrigation schemes, some of which go back to very ancient times.
2. New irrigation projects which have been proposed by the Irrigation Corporation.
3. Projects which have been studied and reported on by independent engineers.

In the case of some of the schemes falling into the first two categories a certain amount of topographical survey work has already been done by the engineers of the Irri-

gation Corporation and preliminary geological studies have been made. The work accomplished will prove of the greatest value in the preparation of the detailed reports which must be prepared for the purpose of deciding executive action. In the majority of cases, however, the planning is still in the preliminary stages and much further work remains to be done. It was noted that in practically no case had the problems of canalization, distribution and use of water been studied to a degree considered necessary for project stage.

In studying the projects which have been submitted to us by the Irrigation Corporation we have been impressed by the serious extent to which it has been handicapped by the total inadequacy of the available maps. The provision of suitable maps is essential to any planned development of the country's resources—particularly water—and without them it is impossible to take a broad view of the lines along which developments should proceed.

In another respect too, the information at the disposal of the Irrigation Corporation has been seriously deficient since there are few data regarding flow characteristics of the rivers which it is proposed to develop. Although in certain instances some river gauging has been done, mostly during the dry weather, we believe that with the exception of the Lar and Karaj rivers near Tehran and the headwaters of the Karun in the neighborhood of Isfahan, and at Ahwaz, few attempts have been made to set up permanent river gauges or to keep a continuous record of river discharge.

Meteorological data with regard to rainfall are also inadequate, while records of snowfall, which in the majority of rivers provide the greater part of the run-off, are wholly lacking. It is therefore to be all the more regretted that so little direct river gauging has been done, and one of the first duties of the new Central Water Authority, which it is recommended should be set up by the Plan Organization, should be to organize hydrological divisions in each district, whose duty it would be to keep continuous records of the flow of all the important rivers.

There is scant information available with regard to salt content of waters and soils under consideration for proposed irrigation projects, except for experience gained in the areas concerned after the prolonged application of irrigation water. In Exhibit D-11 we have given such data as are available from recent observations and measurements. We regard the salt problem as one of the major issues facing the proper development of water-land use and we cannot recommend too strongly that no project should be passed as feasible unless it has clearance on the salt question as a result of reliable field investigations. The importance of the problem may be best emphasized by stating that good water is wasted on bad land, and bad water spoils good land.

Because of the inadequate information available, it has not been possible to prepare definite estimates of the cost of any of the schemes which we have examined or assess accurately the benefits and financial returns which are likely to accrue. Fortunately, however, there are at least three schemes which have already reached a fairly advanced stage of investigation and, with further extensive study, it should be possible to reach an early decision on them. These are the projects which have been studied and reported on by independent engineers. The schemes in question are:

1. The development of the Lar and the Jajirud basins.
2. The development of the Karaj River.
3. The development of the Zayandeh Rud.

All these schemes offer opportunities for the development of both irrigation and power, in addition to which the Karaj may be used to supplement the supply of potable water for the city of Tehran. It is recommended that the review of these schemes should be accorded a high priority by the Plan Organization with the object of selecting the more attractive of them for early construction.

The Lar scheme has been investigated in considerable detail, and river flow measurements are available for a period of one year 1323-1324 (1944-1945). Unfortunately, however, the records which were started at the time these studies were made were not continued after the submission of the original report, and a valuable opportunity of supplementing the information on which the report was prepared has been lost.

Fortunately information in connection with river flow and run-off is available in connection with the Karaj River which, like the Lar and the Jajirud, is fed by the snow fields of the Elborz mountains. Continuous river flow records for the Karaj have been kept since 1322 (1943) and, in addition to affording a solid basis on which to plan the utilization of its waters, will provide a valuable guide to the flow regime prevailing in other river systems where climate and physical conditions are similar.

For these reasons, and because the need for additional food production in the neighborhood of Tehran is insistent, it is considered that the intensive study of these rivers, the Lar, the Jajirud and the Karaj, should be given the earliest attention by the Plan Organization.

The case of the Zayandeh Rud is slightly different from those mentioned above. Here steps have already been taken to supplement the natural flow of the river by diverting the head waters of the Karun which flows into the Persian Gulf. This diversion is being accomplished by means of a tunnel which is now being driven through the mountain ridge which forms the water shed between two rivers. The water as diverted will form a valuable addition to the inadequate supplies now available from the natural flow of the Zayandeh Rud on which the rich agricultural lands around Isfahan now depend. The scheme, however, at present makes no provision for controlling either the diverted waters of the Karun or the flow of the Zayandeh Rud itself. The latter depends for its water on the high mountain ranges which separate the Isfahan plain from the Persian Gulf. During the spring, when the snows are melting, the river carries a considerable flow, the greater part of which is now lost as flood water and eventually evaporates in the salt lakes and swamps which lie in the arid country to the east of the city.

The conservation of the waters of the Zayandeh Rud has already received considerable attention, and various proposals have been put forward for the construction of storage reservoirs on the upper reaches of the river.

During our field studies we have had the opportunity of inspecting several of the alternative dam sites which have been suggested in the neighborhood of Chamasaman and Khoshueh and these are dealt with Appendix D-3. Other sites for storage reservoirs have been suggested at Dimeh and Tangi-Gazi, but unfortunately the flooded state of the roads prevented our making a visit. The sites of these two dams have, however, been examined by foreign geologists and engineers and their reports have been made available to us. They have therefore been included in our references to the Zayandeh Rud.

In general it may said that the Zayandeh Rud offers great scope for the expansion of irrigation and flood production from the fertile lands of the Isfahan plain. At present

it is not possible to draw up any definite scheme of regulation since the fundamental data with regard to the natural flow of the river is not available. Moreover, no detailed plans for irrigation expansion can be prepared until reliable maps of the lands to be irrigated become available. Apart, therefore, from further site studies to determine the best location and cost of constructing storage reservoirs, it is essential that steps be taken at once to prepare detailed maps of the river basin and the lands to be irrigated. These have been included in the priority areas scheduled in the surveying and mapping section included in this volume.

The gauging and continuous recording of the flow of the Zayandeh Rud too is most important and we are informed that this work has recently been initiated at a number of points both upstream and downstream from Isfahan.

Pumping from Surface Sources

Immediate progress could be made with pumping schemes to utilize river waters which are flowing to waste. The waters of the Gurgan and Atrek could be so utilized, and the waters of the Arras could with advantage be used to irrigate the fertile Mughab plain, as has already been done on the northern bank. Similarly it should be practicable to install 40–120 kw engines to pump water from the lower reaches of the Karun since, in general, the land slopes away from the river. In this area the fuel is cheap enough to make the proposition attractive, whereas in the north the alternative, of electric drive from central stations, may have to be considered.

In order to ensure that all planning is in accordance with the principles of maximum re-use of water, which, among other things, emphasize the early development of high altitude storage, we add the following notes dealing with the prospects of hydro-electric development.

Iran is an oil-producing country. Nevertheless she cannot afford to neglect a strict comparison, on economic and strategic grounds, of all power schemes where hydro-electric generation may be the alternative to steam generation, especially if by adopting the former solution, a cheap and reliable source of energy is assured to the nation.

The Prospects of Hydro-Electric Development

No general survey of the water power resources of Iran has ever been made and, indeed, none can be attempted in the absence of reliable contoured maps and data relating to rainfall and river flow. It may be said, however, that opportunities for the development of hydro-electric power will arise under two broad headings:

1. The utilization of the extensive resources which undoubtedly exist in the high mountain ranges of the north and southwest where the precipitation in the form of rain and snow is considerable.
2. The association with irrigation schemes in which high dams are used to store the spring floods which arise from the melting snows.

Schemes falling under the first heading are of two types: (a) high head schemes, generally small, in which the dry weather flow of a snow-fed mountain stream is utilized without any attempt to provide seasonal storage; and (b) high or medium head schemes, which may be of considerable magnitude, based upon the complete or partial regulation of the annual run-off by means of large storage reservoirs.

The first type necessarily makes but limited use of the total water available since the greater part of the annual run-off is lost during the spring floods. While wasteful of water such schemes may, nevertheless, be justified in certain circumstances particularly in the case of short rivers draining high mountain ranges where the winter snows persist late into the summer, thus sustaining the dry weather flow, and where topographical conditions do not favor the creation of economical storage. The northern slopes of the Elborz Mountains would appear to offer the best opportunities of developing such schemes which would possess the advantage of permitting gradual step-by-step development as the demand for electric power increased among the towns of the Caspian seaboard.

As to the second class, in many countries this is the predominant and most important type of hydro-electric project. For Iran, however, it is suggested that this may, perhaps, be an infrequent type until a much later stage in the country's development. There are three factors leading to this tentative suggestion:

1. In nearly all parts of the country water is scarce. Hence if there is any economic opportunity to create reservoirs of any size, their use for irrigation is likely to outrank their use for power.
2. With, of course, some exceptions, dams and reservoirs in Iran seem to be expensive in proportion to the size of the river in which they are located. Silting conditions in Iran may further complicate reservoir economics.
3. Hydro-electric projects involving dams are likely to be of considerable size; in fact, are more likely to be economical if of considerable size. In Iran, except for Tehran, there will be no local market in the near future for large blocks of power. What is needed is power in small blocks close to local markets, with initial investment held as low as possible. In Iran, where for some time the most important item to be conserved is investment funds, hydro power must be developed usually in small blocks with minimum initial investment if the country is to have the benefit of the low electric energy costs possible with hydro. The burden of even relatively short transmission lines is likely to be so heavy that power plant costs per kilowatt must be kept low. There may possibly be numerous relatively small hydro sites in certain parts of Iran, say of 1000 kw to 15,000 kw each.

In general, however, the largest individual schemes are likely to fall into the second class and will be based upon the selection of favorable reservoir sites which offer the opportunity of large scale storage in association with diversion tunnels leading to the utilization of the difference in elevation between adjacent mountain valleys. Into such a class falls the Lar scheme on which a report has already been made.

Any hydro-electric scheme based on storage has a regulating and therefore a beneficial effect upon the river flow, and frequently permits the water discharged from the power station to be re-used for irrigation on the lower reaches of the river. Such dual purpose schemes permit the cost of storage, which often represents the greater part of the total cost of a project, to be divided between the uses to which the water is put and may thus render attractive a scheme which, if considered as fulfilling one function alone, would be difficult to justify on economic grounds.

The use for the generation of electric power from dams and reservoirs designed primarily for irrigation purposes presents special problems, since the water demand for power does not normally coincide with the requirements of irrigation. Generally speaking

the latter is spread over the nine months periods, Esfand to Aban (March to November) inclusive, little or no water being needed for irrigation during the winter months of Azar to Bahman (December to February).

The total quantity of water required to mature crops, the period of year when irrigation is needed and the duration of the application, all vary considerably with different types of crops, but by adopting mixed farming methods combined with the scientific use of irrigation, it is possible to produce a fairly uniform demand for water over the greater part of the year.

It should be noted that the considerable variation in the climate exhibited by different parts of Iran gives rise to appreciable diversity between the cropping periods. This diversity constitutes a favorable factor when considering the possibility of utilizing irrigation dams for the generation of power, since by interconnection between a number of such hydro-electric stations the variations in the amount of water available for power production, as determined by irrigation requirements, tend to compensate one another.

There remains, however, the problem of meeting the electrical demand during the three winte. months when little or no water is required for irrigation and the rivers are at their lowest.

Iran is characterized by hot dry summers and cold winters, during the latter part of which the principal precipitation occurs on the high mountains in the form of snow. The cold winter temperatures combined with the reduced hours of daylight will give rise to an increased demand for electricity during the winter months, and it is probable that the peak load will occur during the three months, Azar, Dey and Bahman (December, January and February) precisely those in which the demand for irrigation water drops to negligible proportions. There is thus during the winter months a wide gap between the water demand for power and irrigation.

These conflicting claims cannot be wholly reconciled although their effect can be greatly mitigated by interconnection between those schemes which operate primarily for the production of electric power from stored water and those schemes constructed essentially for irrigation and in which the generation of power is secondary to the main purpose. During the months of maximum electric demand power stations falling into the first category could be operated on a steady, uniform output as base local plants. During the height of the irrigation season the hours of operation of these plants would be curtailed as much as possible so that they carried only the daily peak of the electrical load. Power stations operating in association with an irrigation scheme would be operated in the reverse manner, the daily hours of service being reduced to a minimum during the winter months in order to conserve stored water for the irrigation season. In this way the two types of hydro-electric schemes would assist one another, and water stored primarily for irrigation purposes would be used to the greatest advantage.

It will be appreciated that the co-ordinated use of the two types of hydro-electric station referred to depends upon their being interconnected by means of an electrical transmission system. Distances between the principal cities of Iran are relatively great and on economic grounds it will not be possible to attempt any large scale inter-connection between them until considerable expansion has taken place in their electrical demands. For the present, therefore, and for some years to come, the scope for securing the maximum utilization of water storage will be limited, but in planning the development of the country's water resources the benefits of co-ordinated use should be kept prominently in mind.

It is suggested that a start should be made by undertaking field studies of the more promising hill streams in the neighborhood of the main centers of population including Tehran, Resht, Tabriz, Hamadan, Kermanshah, Isfahan, Ahwaz, Shiraz, Kerman and Meshed. Priority should be given to those cities where industrial development is likely to expand most quickly, the field reconnaissance being confined in the first place to a radius of 100 kilometers and later, if circumstances appear to warrant it, expanded to 150 kilometers.

Until more adequate maps become available, these reconnaissance surveys will, of necessity, have to be based upon the existing topographic maps, and since the information provided by them with regard to levels will generally be found to be wholly inadequate, aneroid barometers will have to be largely relied upon to provide essential data with regard to the heads which appear capable of development.

Estimates of the quantity of water available can, during the early stages of these investigations, be little more than an intelligent guess, but as more data are accumulated by the direct measurement of river flows, it will be possible to revise and refine the first preliminary estimates by utilizing the more complete knowledge of precipitation and flow regime which will be gradually built up as the result of systematic study.

From these early reconnaissance surveys it will be possible to select the more promising sites for detailed investigation. The latter must be based upon reliable contoured maps covering the whole catchment area which it is proposed to examine, and, since the storage reservoirs associated with hydro-electric schemes will favorably affect the prospects of irrigation on the lower reaches of the river, it will usually be found profitable to extend the surveys to cover the whole of the river basin.

For preliminary planning purposes such surveys should not be on a smaller scale than 1: 50,000 with contour intervals of 25 meters, except on the higher parts of the catchment area where intervals of 50 meters will generally be found adequate.

A close study of the maps prepared in this way will disclose the most favorable method of development and indicate the location of the main storage reservoirs and other works. It will thus become possible to select the areas which will require to be mapped to a larger scale to permit a detailed study to be made. These large maps, which should be prepared to a scale of 1: 10,000 with appropriate contour intervals, will permit preliminary estimates to be made of the cost of the scheme.

Since the cost of the main dams usually represent a large part of the total, it is important that detailed surveys should be made of the sites to be occupied by the principal works. The surveys should be accompanied by geological studies, covering both the site of the dams themselves and the reservoir areas, and should be supplemented by the sinking of trial pits and bores in order to check up on the geological structure of the site. In favorable cases these sub-surface investigations may be quite nominal, but in the majority of cases, where the foundation conditions cannot be confidently estimated from a surface examination, an extensive program of work may be necessary even during the preliminary planning stage of a scheme.

The investigations described above should be undertaken with the object of preparing comprehensive project reports which will be accompanied by reliable estimates of power output and cost, and it is on such estimates that a decision must be taken whether or not to proceed with the construction of the scheme.

On the assumption that the project report is favorable and it is decided to proceed with the execution of the work, the next stage will be to carry out construction surveys. These surveys will be to a larger scale than those used for the project report, would normally be carried out by conventional ground methods and will form the basis for the detailed design of the individual works. They will be accompanied by such further subsurface investigations as may be considered desirable in the light of the conditions disclosed by the earlier field work.

As regards the high head non-storage schemes, topographical surveys and contour maps are not such an urgent necessity.

In the usual case we are interested not in finding the sites which intrinsically are the best, but in finding good sites close to an available market, which considerably narrows the search. A stream near a growing town which appears to have a steep slope and appears to have a fair amount of catchment area at high elevations is a good candidate for field study.

It would be highly desirable to establish gauging stations on a few typical small streams, particularly along the Caspian coast, to determine whether there is any regularity of pattern for the relation between summer flow and preceding precipitation records, or between one stream and another. In a limestone country the presence or absence of springs may greatly affect the minimum flow of minor streams.

There are in the Caspian area at least three sections where immediate starting of study seems important, the three covering a wide range of sizes of development.

1. Shahi area: Here it is recommended to start at once a local transmission grid serving Shahi, Sari, Behshahr, Babul and possibly later Amul. Initially one 5,000 kw steam unit would be installed near the railroad at Shahi for service if possible in 1330 (1951), with a second 5,000 kw unit to follow probably in 1332, or possibly in 1331. The second 5,000 kw unit might be indefinitely postponed if some local small hydro installations were found feasible. Three streams located near the proposed lines may have possibilities, Babul, Rud and Sedj Rud west of Shahi where possibly 0.5 cms and heads of 300 to 600 m might be developed, and a river just east of Sari with apparently larger flow and lower head. If any of these sites are to be substituted for the second 5,000 kw steam unit, stream measurements starting in the late summer of 1328 are essential. See also the report section on electric power in Vol. IV.

2. Resht area: This city needs considerable power at once and with the towns east of Resht may be using 8,000 kw or more within seven years. A stream about 70 km east, the Pulirud, might be developed for this much or more. Here also prompt starting of stream measurements is important. Possible alternatives would be a group of small streams east and southeast of Resht.

3. Lower Heraz: Here apparently a head of 400 to 600 m or more might be developed, depending upon how much of the gradient is used, and even after allowing for eventual diversion of the upper Lar, 10-12 cms may be available. This would indicate 35,000 kw to 50,000 kw continuous dry season power, or up to twice this amount at 50 per cent daily load factor in the dry season.

As a general guide preliminary field studies should include:

1. Profile of stream.
2. Possible intake sites and conditions there.
3. Flow line conditions on sides of valley.
4. Tunnel conditions as alternative to flow line for larger flows.
5. Pond for daily regulation at intake or, if practicable, nearer to power station.
6. Power house site with minimum length of heavy steel sections of penstock.
7. Construction access.

THE INTERCEPTION OF UNDERGROUND WATER RESOURCES

Possible Solutions and Alternatives

It has been estimated that of the total precipitation of snow and rain about 24 per cent percolates into the fissures and pores of the mountain rocks, or through the porous areas of the valley floors, whence it seeps into the subsoil aquifers below the alluvial fill in the valleys. Of the total quantity which percolates into the ground in this way approximately 10 per cent is extracted by existing kanats and wells, and for the water so extracted a small portion may again, after use, pass back once more to the subsoil.

It is important to realize that the whole of the water in the aquifers is moving; that part which is retained in fine sand or clay, very slowly indeed, while the portion which has flowed into old buried river beds of gravel and boulders may possess appreciable velocity, since resistance to its movement under the effect of gravity is relatively low. Finally, all this water is either evaporated uselessly from the surface of swamps or kavirs or passes into the sea, and is continually replaced by percolation from the mountains. The lag in time for such replacement varies, but the effect of an extra low or high rainfall may not be felt at the lower end of a valley for months or even years.

The manner in which subsoil water is yielded is illustrated in Exhibit D-12, which shows the hydrograph for the British Embassy kanat in Tehran for the period of 1320-1327, and the monthly rainfall for the same period. It is interesting to note that the period of high discharge is, in general, prolonged until about Mehr (October) and that the ratio of maximum to average discharge is fairly low.

Since the depth of the water-table is generally greater than can be economically worked for irrigation purposes by bullock power from wells (as is done with the shallower water-table in the plains of India) other methods have been developed, and in Iran and Baluchistan the kanat has been from time immemorial the standard device for tapping the subsoil water.

Kanats

The kanat suffers from a number of serious disadvantages, and in recent years the deforestation of the hillsides in combination with a series of years of subnormal rainfall has led to a gradual lowering of the water-table with the result that a large number are no longer productive. In the Abadeh valley 50 out of 110 kanats are now useless.

The advantages of kanats are that:

1. Maintenance is comparatively small.
2. The whole construction and maintenance involves local materials and labor only and no foreign exchange is needed.

The disadvantages are that:

1. The capital cost is high (See Appendix D-4).
2. The quantity of water obtained is uncertain, and much money and effort may be spent looking for better mother-wells.
3. The kanat cannot fully develop a good aquifer, and seldom, if ever, dips far into the more productive lower levels. Lower aquifers are usually quite inaccessible.
4. A small drop in the level of the water-table will ruin a kanat completely, since space seldom permits the pursuit of the water-table by extending the tunnel.
5. The water is nearly always polluted from the surface somewhere along the course of the kanat.
6. The area commanded is limited to that which lies at a lower level than the point at which the tunnel reaches the surface.
7. As it is prohibited by law to sink new mother-wells within one kilometer of existing mother-wells or wet sections of kanats, it may happen that a good aquifer is drawn upon by only one indifferent kanat, although the subsoil flow in the area may be sufficient to supply many times the quantity of water actually extracted.
8. A kanat is subject to interruption by roof falls, and by silting in the tunnels.
9. A large area of land is rendered useless by the heaps of earth left at the head of every shaft.
10. As the flow in a kanat cannot be controlled to meet requirements, it follows that water must be wasted whenever the demand for it falls short of the supply.
11. The time required to construct a kanat is excessive (two to seven years).

Pumped Wells

An alternative to the kanat as a method of exploiting the subsoil water is the pumped well, the advantage of which may be summarized as follows:

1. A well, suitably placed, can draw from a perennial source and the output will vary little with seasonal changes in water-table level.
2. A well draws from the bottom of the aquifer, and if sited on a subsoil flow, the draw-down is small and the maximum output can be obtained.
3. With a pumped well the supply of water can be regulated in accordance with the demand, thus avoiding the waste that a continuous flow must entail.
4. A well can be sited to command the most suitable area of ground, town, or village, and no irrigable land need be wasted, except where the aquifer is unsuitable or does not exist under the upper slopes of the valley.

5. The pump house takes up little space compared with the areas occupied by kanat spoil-heaps.
6. Wells, on subsoil flows, can be spaced as close as 50 meters without mutual interference, and a great part of the moving subsoil water can be withdrawn for use, even fairly close to waste areas such as salt lakes.

The disadvantages of pumped wells are:

1. Fairly high initial cost combined with continual expenditure on maintenance and on the power required for pumping.
2. If the pumping is performed by means of an independent oil engine the service of a skilled operator is required, although if a number of wells are grouped together it would be possible for one man to look after several installations.
3. The equipment has to be purchased outside Iran, involving the use of foreign exchanges.

In general it may be said that a modern pumped well possesses great advantages over a kanat except where the ground slope is steep, the aquifer near the surface, and the material of the aquifer coarse so that the movement of water into the wet part of the kanat is easy.

The majority of kanats are very old, some going back many hundreds of years, and only a very few are really good. In these cases, those responsible for their construction were fortunate enough to discover by trial wells an aquifer, with a good subsoil flow, at a depth which could be used for the area to be irrigated, allowing for the necessary slope on the kanat tunnel.

In general the valleys or plains of Iran are surrounded bv mountains, on many of which a cap of limestone still remains. The foothills frequently consist of clay, and the screes from the side valleys are gravels and sand. This formation leads to a similarity of subsoil in the valleys. Above a fill of varying depth of impervious clays there are usually one or more aquifers in which the surface stream probably ran in remote geological ages. Over these aquifers there are layers of clay, or of stone and clay, and, on the present surface river-beds, of gravel and boulders.

Subsoil water is fed into the aquifers from the hills by percolation and from blind springs, or, after rain, through fissures in the upper impervious layers. This water may lie throughout the valley-floor, but it only moves appreciably in the ancient river-beds, now acting as pipes.

To put a mother-well for a kanat, or a borehole, on the line of such a stream would, clearly, be most advantageous, and search by trial bores would be justified if the optimum site could be found. Unfortunately the subsoil stream seldom coincides with the present surface flow from the same side-valleys, as is also true in the case of the main valley flows. The difficulty of locating these subsoil flows in the past is indicated by the fact that an occasional first-class kanat is found in an area where all the other kanats are of a small and unreliable output.

Aquifers will usually be found to be nearer the surface at the top of the slopes at the sides of the main valley, but kanats starting near the foothills tend to have greater

seasonable fluctuations and are much more subject to failure from variations in water-table level due to dry years.

The most favorable position for a well, whether it be intended as a mother-well for a kanat or for a borehole, is therefore:

1. On the line of the main valley subsoil flow, as far as possible down the valley.
2. On side-valley subsoil flows, far enough from the foothills for the maximum percolation to have taken place.
3. In any area where the aquifer is of coarse material even though movement of the subsoil water may be very slow.

It follows that, since a pumped well can never draw more than a proportion of the water moving as a subsoil flow (although the proportion may be high when the pump is working with a large drawdown), and since there must be percolation or side flows to renew the subsoil flows, a succession of wells sited along the line of a good subsoil flow would not interfere with one another. Finally, where several subsoil flows, more or less parallel, pass down a valley, a succession of lines or groups of wells, sited across the flows, could be used to extract the maximum possible proportion of the subsoil water without unduly lowering the water-table. This system could be applied to such valleys as Abadeh, Isfahan North and Khaf. The lowest well or line of wells could then be sited close to a kavir since the tendency of the well to reduce the water-table level would also tend to reduce the risk of salinity increasing on the surface due to the irrigation.

Subject to the availability of cultivable land the development of subsoil water throughout a valley should, therefore, be planned to utilize the side-valley flows as close to the hills as possible. This development would be followed by wells, or groups of wells, sited on the main valley subsoil flow and extending to the limits of cultivable land.

Buried Cut-offs

A special case of development which eliminates pumping is applicable to side or main valleys where the stream-bed passes through a narrow gorge the bed of which is filled with gravel, boulders and sand.

In such cases there is invariably a perennial subsoil flow beneath the river-bed, which usually remains untapped and flows to waste. By constructing an impervious wall in the gravel bed, carried up to, but not above, flood level, the whole of the subsoil flow can be brought to the surface and extracted for irrigation or other purposes. The expense of constructing such a buried wall would be small compared with the normal type of dam or weir, and there would be little or no danger to the structure from winter and spring floods.

It will be appreciated that a buried cut-off of the type described would render useless any kanats or wells which might be situated in the valley immediately downstream, but since the whole of the subsoil flow would be intercepted the net gain in water would be many times that previously developed, and, as it would be brought out at a higher level, it would command a correspondingly greater area of land.

While this arrangement makes full use of the dry weather flow it possesses no storage and hence no conservation of flood water.

Examples where a buried cut-off could be used with advantage are to be found in the Shahpur River gorge above old Shahpur City, the gorge above the Firuzabad valley, and the lower ends of the gorges of the Karaj and Kan Rivers where they debouch on to the plain.

General Conclusions

There are three main methods by which subsoil water can be developed: kanats, pumped wells, and buried cut-offs in narrow valleys. Of these, new kanats are considered the least important. There are a few small areas with shallow aquifers and considerable surface slopes where kanats could be used for the production of small quantities of water, but a pumped well in the same area should produce a better supply.

Up to the present less than one hundred pumped wells have been put into production in Iran. The majority of them have been constructed at the instance of a private landowner, a municipality, or a factory owner, with little regard to the suitability of the site. Consequently many of these wells are not as good as they would have been had they been sited with greater care.

Villages, together with their adjacent areas of arable land, are normally located astride the surface stream-beds. Winter irrigation water is obtained by means of "jubes" tapping the surface run-off in these beds, and domestic and summer irrigation requirements are supplied by kanats.

Only in a very few cases do the kanats draw from the subsoil flows which emanate from the valley gorge and which, after dividing into a number of minor flows, ultimately disappear through the aquifiers of the valley floor into swamps, kavirs, the sea or across frontiers.

Subsoil flows usually increase in depth with increase of distance from the hills, and the optimum site is one that is at a sufficiently high level not only to command all the land it is desired to irrigate but also to tap the flow where it is shallow and before it divides. This will usually be well below the wet sections of local kanats, and, unless the aquifers are over-pumped, will have little or no effect on existing kanats.

Wherever, therefore, the conditions of a good catchment area in the hills discharging through a valley to a good agricultural area exist, it is considered that a pumped well or wells project is the most desirable.

It is considered that there are very few areas, such as are described above, and where more water is required, which could not be developed economically and the irrigated area much increased. (See Appendix D-4 for a comparison of costs).

The third method, development by buried cut-off, requires special conditions of site which must be carefully surveyed before the preparation of a project.

Note on the Use of Buried Cut-offs

There are a number of sites suitable for this method of development of subsoil water in Iran, of which four have been examined by short reconnaissance, but all of which will require survey and study before projects can be prepared.

The site for a cut-off must be sufficiently far up the gorge to give the necessary head for a gravity flow to the arable land, and should be selected for the probability

of an impermeable bed rock rather than for actual small size of cross section of the river bed fill. The depth of fill, which will usually be sand and gravel, with larger boulders below, is unlikely to exceed 8 m at the deepest point in any of the four sites examined.

The finished structure will consist of an impervious wall keyed in to the rock of the river bed, and with its top at or just below the level of the normal river bed. This will enable flood water to pass over the cut-off without causing it damage. This wall will be of such a thickness that it can withstand the upstream pressure of the water, taking into account the support given by the replaced river bed fill. The cut-off wall can therefore be of much lighter construction than a dam above bed level, and if the cut-off is made of puddled clay, the wall will correspond closely with the core of an earth dam.

It is proposed that a conduit shall be inserted in the wall with its top below river bed level, at one side of the river bed, and, as in the construction of kanats, the conduit shall be large enough to be traversed by men for cleaning; and it shall be graded so that its lower end shall emerge on the river bank clear of flood level and there transfer the water to a suitable jube. There would be no difficulty in dividing the water between river banks by inserting a second conduit and jube on the opposite bank with suitable measuring and control arrangements for the division of the water.

In this manner the whole of the subsoil flow will be removed from the river bed and delivered at the surface, a result which could not be obtained by wells or kanats.

In Appendix D-5 we have given a typical example of possible development of subsoil water in a sub-montane valley, and in Appendix D-6 we have included a list of areas which should be explored for the possibilities of buried cut-off construction.

RECOMMENDATIONS

In the foregoing chapters we have dealt with the existing situation, the nature of the problems, possible solutions, vital factors of influence and general conclusions. There remains the making of recommendations with regard to a program of action, indicating order of priorities where possible, and to the allocation of Plan funds.

FUNDS ALLOCATED UNDER THE SEVEN YEAR PLAN ACT

The sum allocated by the Majless for this section of the Plan amounts to Rls. 1,850,000,000. Having regard to the total needs of the country and to the extent by which it is desirable to raise standards of living, the amount allocated may be deemed insufficient.

However, this allocation is considered to be adequate, taking into account the following factors:

1. The present lack of reliable information and statistics, and the need to accumulate further data.
2. The need to complete reliable engineering, geological and agricultural studies, including estimates of construction and operating costs.
3. The reorganization required for the proper implementation of a plan of the magnitude envisaged, including the training of personnel and the recruitment of suitable skilled advisers.
4. The need for schemes to be self-supporting wherever possible.

Hence, the problem resolves itself into the selection of schemes and priorities with a view to making the best use of available natural resources within the limits imposed by the allocation for water resources.

RECOMMENDED ORDER OF PRIORITIES

Whereas it is essential to take immediate steps toward development and conservation of water resources, there is a distinct danger that precipitate action, aimed more toward the showing of early results rather than toward a balanced order of development, may result in the initiation of schemes which may subsequently not fit into the long-term plans of development satisfying the criterion of maximum benefit for the greatest number.

The water demands resulting from an improved living standard and an increasing population will inevitably rise, while there is no means of augmenting the average annual water intake or of mitigating the seasonal deviations from the mean except by careful husbanding of resources.

With the above in mind, we recommend the following order of priorities:

1. Reorganization involving the establishment of a competent water authority and subsidiary organizations to deal with strategic and tactical planning, and with the execution of the Plan. The subsidiary organizations should include:
   a. A survey organization capable of launching an immediate survey and mapping program making the maximum use of air survey.
   b. An efficient meteorological organization and a national network of meteorological and hydrological stations.
2. Final investigations relating to schemes where knowledge is already far advanced and where it is only necessary to choose between alternative locations and capacities and to fix methods and stages of development. Coupled with this priority is the execution of schemes for which little or no further studies are required.
3. Urgent studies relating to whole catchment areas of considerable water resources capable of multi-purpose development and where the possibilities of re-use are high.
4. Studies covering other projects scheduled for investigation, together with reconnaissance work on new projects brought to notice as maps and information become available as a result of the measures taken under (1) above, followed by an orderly program of execution which will be intensified progressively toward the end of the Plan period.
5. Long-range planning with a view to providing continuity at the end of the Plan period.

First Priority

Our recommendations covering the establishment of a Central Water Authority, a survey and mapping department, and a National Meteorological Service have already been given in detail earlier in this section and in Appendix D-2, in the surveying and mapping section, and in the meteorological section.

In the latter two sections we have recommended allocations for the survey and meteorological organizations. From reference to the respective recommended allocations of these sections it is seen that early peaks in expenditure are emphasized, indicating a rapid implementation of the program and the early purchase and importation of equipment.

It is understandable that foreign currency requirements for surveying and mapping should be relatively high. If maps of the necessary standard of reliability are to be available in time to implement the Plan program in all respects, the survey program must be launched in the first year, and foreign air survey contracting firms must be used. Against this could be offset the fact that, in the early stages, only a small though competent survey organization need be maintained in Tehran, concerned mainly with specifications, the letting of contracts and training.

It is obviously essential that the establishment of the CWA should be carried out immediately, so as to permit the setting up of the other organizations within the first year. Our budget recommendations for the seven years are based on these fundamental assumptions.

The CWA should devote immediate attention to the launching of a training program in accordance with the recommendations made earlier in this section. This program should be financed from the Rls. 1,000,000,000 fund provided for "Grants to technical institutions for training of skilled workers . . . " (Chapter VI, fourth item, of the Act). It follows that the sooner the CWA formulates its plans in this respect, the sooner it will be able to substantiate its claim on the training fund.

We are satisfied that the reorganization of the Independent Irrigation Corporation into the Central Water Authority, including decentralization into four water districts, and the establishment of a hydrological service can be accomplished with the sum of Rls. 280,000,000 set aside for the purpose, and leave sufficient for the survey of water resources.

The following is our estimate of expenditures covering the establishment and operation of a hydrological service under the CWA including three snow survey experiment stations. The figures include equipment and field salaries, but not head office overhead, which are allocated to the general organization cost of the CWA.

In Thousands of Rials

Year	Domestic	Foreign Exchange	Total
1328—Second Half	2,500	2,000	4,500
1329	5,000	3,000	8,000
Remaining 5½ Years	28,000	2,500	30,500
Total	35,500	7,500	43,000

Second Priority

Under this heading there fall:

1. Surface schemes which have been studied in sufficient detail to merit advanced investigations with a view to design and construction of works.
2. Development of subsurface resources in areas where conditions are known to be favorable, coupled with continued exploration for further "development areas".

Surface Schemes

From Appendix D-3, covering schemes listed by the Independent Irrigation Corporation, it will be seen that only three major projects are considered to qualify for immediate studies as regards design and construction. These are:

1. Karaj River: with special reference to its development for water supply, irrigation, and hydro-electric power.

2. Zayandeh Rud: with special reference to irrigation and hydro-electric power development, the first objective would be the completion of a comparative economic study of the alternative reservoir sites available on the Zayandeh Rud, including the sites at Dimeh, Tangi-Gazi, Khoshueh and Chamasaman.
   This study should be accompanied by geological investigations, drilling, etc.
3. Jajirud: the Latiyan scheme which was prepared in 1324 should be reviewed in light of the more complete information which has since become available, and special attention given to the possibilities of developing hydro-electric power as well as irrigation development in the Veramin plain.

We recommend that in all the cases consulting engineers be employed for these advanced investigations, and for the design and supervision of the work.

In addition to the foregoing major projects, we recommend that steps be taken to:

1. Press ahead with the completion of the Shahbankareh scheme now under construction.
2. Complete the preliminaries with a view to the execution of the Gulpaigan project.
3. Complete surveys and designs with a view to constructing permanent weirs at Sistan (Project 22, Appendix D-3) and at Bampur (Project 23, Appendix D-3).
4. Complete economic studies with a view to assessing the possibilities of utilizing the waters of the Atrek, Gurgan and Arras rivers for irrigation by pumping from the surface, using diesel or electric prime movers. Similar action should not be taken with regard to the Karun River until the catchment studies recommended under the next priority have been completed, and an overall plan of development has been drawn up.

Sub-surface Development

The need for development of water resources is so great that it will not be possible, in all cases, to defer action until sufficiently reliable data become available. Fortunately it is possible to meet immediate needs to some extent by initiation of a program of sub-surface development. Exploratory work in connection with individual schemes will not take long, and there is sufficient plant and equipment in Iran to commence the program and to carry on until new equipment arrives.

For planning purposes we recommend that, although development of sub-surface water resources in the high rainfall intermontane valleys should not be discouraged, the real effort under the Plan should be concentrated on the area defined as "lying below the 250 mm precipitation contour". Reference to Exhibit D-1 will serve to demonstrate the need to increase water resources in this area as compared with the large "export" areas. The above definition includes such needy areas as the Makran, Baluchistan and the Gulf coast, where subsistence is at an incredibly low level, and where disease and proverty are rife. Typical of the towns needing immediate supplies of potable water are Bandar Abbas and Bushire. The question of potable supplies for this area is also referred to in the town improvement and housing section of our report.

Surface schemes would not be the most practical solution here. Rainfall is deficient and unreliable, catchment areas are small and flat with an absence of storage sites, and temperature and other conditions, chiefly the relation between precipitation and run-off, are such that storage losses would be high.

Of the three methods described above dealing with the interception of underground resources, we regard pumped boreholes as the most desirable solution for Iran in the future, provided every effort is made to reduce the cost of drilling and operation of boreholes. This does not mean that existing kanats should be abandoned, thereby destroying sources of water. It means that, so far as the Plan is concerned, the major effort should be concentrated on the development of borehole supplies.

Kanats

New kanats should be constructed only in cases where there is convincing evidence favoring this course. In such cases every effort should be made to reduce the costs of construction by:

1. Using modern tools.
2. Locating mother wells in the light of geological and other information.
3. Evolving ways and means of controlling usefully the waters which now run to waste during the winter months.

In the budget figures given later we have included the sum of Rls. 40,000,000 for rehabilitation of kanats and for new construction.

Buried Cut-offs

We recommend that the sum of Rls. 20,000,000 be earmarked for a program of exploration, including drilling and test pumping, with the object of diverting shallow underground waters by means of buried cut-offs. Early priority should be given to the following areas, which have also been listed in Appendix D-6: Kan, Karaj, Tabriz (Falkhed Rud), Shahpur, and Firuzabad.

Reconnaissance work should be extended to cover other areas which may be suitable for such development.

No allowance has been made in the above figures for the actual construction of such schemes, which will have to be covered by the sums allocated for dam construction.

Pumped Boreholes

There is sufficient equipment and casing in Iran to sink from 100 to 150 wells, and sufficient pumps and prime movers to equip about 50 small wells. Part of this equipment is already earmarked for Government and private projects. We have included estimates for 45 wells to be drilled and tested in 1328, the majority of which could be fitted with pumps from stock.

It is necessary to increase the reserve of pumps and equipment for subsequent years, and these must be ordered at an early date to avoid delays of delivery and transport. In the particular case of pumps it is advisable not to carry too large a reserve, since all wells should be regarded as experimental until prolonged pumping tests have been completed.

Immediate action should be taken to study irrigation and town demands in the areas where wells are proposed. The following towns urgently require a domestic supply and this can be accomplished most economically by pumped boreholes: Meshed, Kerman, Yezd, Naiin, Hamadan, Bandar Abbass, Bushire and Iranshahr.

About 15 wells are immediately required for supplying water to agricultural experiment stations and to demonstration farms.

A list of boreholes and buried cut-offs by ostans is given in Appendix D-6.

Budget for Sub-surface Development

The recommended allocations for sub-surface development are shown in Exhibit D-17. They include the amounts allocated for kanats and buried cut-offs, for both of which a constant rate of expenditure has been assumed. The high initial allocation is for plant and equipment which will gradually be installed during the remainder of the program.

Sub-surface development should be carried out under the general supervision of the Central Water Authority, but private enterprise should be given every encouragement. There should be the closest collaboration between the water, agricultural, health, education and town authorities, and great care must be exercised to ensure that sub-surface resources are not over-exploited.

Third Priority

This priority covers:

1. Urgent studies relating to large catchment areas of great water potential where multi-purpose development is possible, and where the risk is present that early, unplanned piecemeal development may compromise the best ultimate use being made of natural resources.
2. Studies of small steep catchments in high precipitation areas situated near existing or potential electrical demand centers, the object being hydro-electric development.

Large Catchments

Immediate steps should be taken to study the catchment areas of:

1. The Karun River system, including the Diz, with reference to irrigation development of the Khuzistan plains, hydro-electric power development, flood control in the lower Karun area, silt control in reservoir and port areas, land reclamation, maintenance of river navigation and population settlement.

Special attention should be given to the possibilities of the Shushtar scheme described in Project 13, Appendix D-3, and to the possibilities of replenishment of underground water resources by deliberate flooding of special areas.

2. The Kur River system with special reference to irrigation and power development and silt control. Construction of schemes on tributaries should await the completion of these comprehensive investigations.

3. The Sefid Rud system with reference to irrigation and power development. Attention should be given to the possibilities of diverting the Shah Rud (Talaghan) with a view to irrigating the flat Kazvin plain areas.

In all three cases good maps will be essential for the investigations recommended and priority has therefore been given to the mapping of these areas (see surveying and mapping section).

We recommend that competent consulting engineers should be employed for these studies. Having regard to the program laid down for mapping and meteorology it is

estimated that these investigations will not be completed until toward the end of the third year. Every endeavor should be made to achieve this date, however, so that a program of development could be initiated from the fourth year onward.

Hydro-electric Studies

Investigations covering the possibilities of developing hydro-electric power by high head, non-storage schemes should be started as soon as possible in accordance with the recommendations made earlier in this section, priority being given to the three areas around Shahi, Resht and the lower Haraz Rud.

For these studies good maps are not so essential, but careful studies should be made of the likely trends of electricity demands.

With less immediacy, field studies should be undertaken covering the more promising hill streams in the neighborhood of the main centers of population, including Tehran, Tabriz, Hamadan, Kermanshah, Shiraz, Kerman and Meshed. (Isfahan, Ahwaz, and Resht have been included in recommendations made elsewhere.) Priority should be given to cities which will most likely undergo early industrial development, the field reconnaissance being confined, in the first place, to a radius of 100 km from the demand centers.

Fourth Priority

This priority includes the remainder of the schemes listed in Appendix D-3 and for which studies have not advanced sufficiently to permit immediate commencement of construction.

In most cases it will not be necessary to employ foreign consulting engineers, but the CWA should employ qualified advisers to assist in the essential further investigations.

Special recommendations have been made in individual cases in Appendix D-3.

The budget allocations have been based on our estimate that it will not be possible to commence a serious program of construction until the third or fourth year.

We consider that in every case there are reasonable possibilities of the schemes being productive though in some cases, as, for instance, Aklamad, Dasht, Rezaiyeh and Rafsinjan, a modified approach will be necessary along the lines recommended in Appendix D-3.

Fifth Priority

Towards the fourth year a small but capable planning section should be operating under the CWA, staffed with the best men available, who should have had an opportunity to gain experience abroad, or with the foreign consulting engineers engaged in connection with the recommendations made under third priority above. By that time mapping should have advanced considerably and the meteorological organization should be functioning properly. This planning section should be able to draw on the services of one of the specialist advisers attached to the CWA.

The functions of this section should be to plan ahead, to extend the list of known schemes as more maps and information become available, and to prepare priorities for the investigation and execution of new schemes. In this manner it should be possible to effect continuity at the end of the Plan period, or at the end of the construction period initiated under the Plan.

ALLOCATION OF FUNDS

In view of the vast amount of exploratory work yet to be completed it is obviously impossible, at this stage, to give a detailed analysis of funds allocated, particularly covering such items as irrigation and dam construction and power development.

The following Summary of Exhibit D-17 is therefore given merely as a guide to the recommended allocations.

	In Thousands of Rials	
1. a. Organization and operation of the CWA including district branches and a hydrological service	160,000	
b. Survey of water resources, surface and underground	120,000	280,000
2. Development of underground resources including wells for potable supply schemes		
Kanats	40,000	
Buried cut-offs: exploratory surveys	20,000	
Pumped boreholes	286,000	346,000
3. Available funds for the construction of reservoirs, canals, distribution canals, power auxiliaries, buried cut-offs		1,224,000
Total		1,850,000

APPENDIX D-1

SILT CONTENT OF RIVERS

The silt content of river water varies with the season, flood conditions and the geology of the watershed. The figures given below, therefore, can give only an approximate comparison of the silt content of three rivers of Iran with other rivers, but these figures do indicate that these Iranian rivers are among the high silt content waters of the world, due in great part to the almost complete deforestation of the hill and mountain slopes.

RIVERS OF IRAN

		Proportion of Silt	Parts per Million
Jajirud (below Latiyan dam site)		1 in 220	4,500
Zayandeh Rud	Pul-i-Cheshmeh	1 in 175	5,700
	Pul-i-Khayan	1 in 200	5,000
	Pul-i-Marnan	1 in 555	1,800
	Pul-i-Qaleh	1 in 114	8,800
Karun		1 in 150	6,700

RIVERS OF OTHER COUNTRIES

River	Country	Proportion of Silt (by weight)
Colorado	United States	1 in 142 (A)
Danube	Europe (various)	1 in 2,880 (A)
Ganges	India	1 in 900 (B), 1 in 123 (C)
Guadalquivir	Spain	1 in 534—minimum 1 in 6,250 (C)
Hwang po	China	less than 1 in 1,000 (B)
Indus	India	1 in 237 (B), 1 in 150 (avg) (C), 1 in 1,485 (min) (C)
Irrawady	Burma	1 in 1,750 (B), 1 in 743 (C)
Kistna	India	1 in 302 (B), 1 in 42 (C)
Mississippi	United States	1 in 1,500 (A & B), 1 in 681-572, max (C), 1 in 8,000 (avg) (C)
Missouri	United States	1 in 265 (A)
Nile	Egypt, Sudan	1 in 1,900 (A), 1 in 670 (B), 1 in 1,136 (avg) (D)
Po	Italy	1 in 900 (A), 1 in 300 (B & C), 1 in 1,064 (avg) (C)
Rhine	Germany	1 in 100 (B & C)
Rhone	France	1 in 1,775 (A), 1 in 45 (C)
Rio Grande	Mexico	1 in 291 (A), 1 in 60 (B), 1 in 160 (C)
Sutlej	Pakistan	1 in 83 to 1 in 333 (B), 1 in 34 (C)
Tigris	Iraq	1 in 53 max, 1 in 8,350 min (B), 1 in 63 max, yearly avg 1 in 588 (C)
Vistula	Poland	1 in 48 (C)

The letters A, B, C & D refer to the source from which this information has been obtained, as follows:

(A)—"Regulation of Rivers" by Van Ornum, published by McGraw-Hill, 1914.

(B)—"River & Canal Engineering" by Bellasis.

(C)—"Irrigation Pocket Book" by Buckley, published by Spon.

(D)—"Egyptian Irrigation" by Willcocks & Craig.

APPENDIX D-2

PROPOSED CENTRAL WATER AUTHORITY

SCOPE

It is of the utmost importance that effective steps shall be taken to secure control over the development and use of the national water resources. With this object in view we recommend that there should be one supreme authority, the Central Water Authority (CWA), whose duties will include:

1. Survey of the water resources of the whole country, collection, recording and publication of hydrological statistics.
2. Preparation of all irrigation schemes, and supervision of execution and management.
3. The granting of licenses for the development of hydro-electric power.
4. Technical assistance in connection with water supply schemes for local authorities and municipalities.
5. The setting up of a survey department which will be responsible for the production of all maps.

POWERS

The CWA will be a permanent non-political organization with a head office in Tehran and should be permanently represented in the Plan Organization. It must be given statutory powers to acquire compulsorily, with appropriate compensation to the original owners, water rights, land and any rights incidental to the conservation and use of water. These powers should be in accordance with the recommendations contained in the legal matters section (Vol. V).

The CWA shall have power, notwithstanding any existing rules or customs relating to proximity to existing kanats, mother-wells, springs or other sources, to carry out trials, by wells and boreholes, of the water resources of any area, provided that existing water rights are respected and existing supplies are not reduced thereby. Should development by the CWA take place after trial, the owners of water rights in the area shall have priority to benefit by purchase from any increases in the supply, and to receive compensation should the supply of water be reduced.

Ownership of Water

All rights concerning additional controllable water made available as the result of works carried out by the CWA shall be vested in the Government. Such additional water shall be at the disposal of the CWA, which shall be entitled to make such charges for its use as may be appropriate.

Survey and Mapping

An important function of the CWA will be the production of all maps and surveys, for which purpose a special survey department shall be set up. This is dealt with more fully in the section on surveying and mapping in this volume.

Hydro-electric Power

Where economically justified the CWA shall be empowered to construct and operate its own electric power stations as a part of an irrigation scheme. The power generated will normally be sold in bulk to public and private electric supply undertakings.

The CWA will be permitted to grant at its discretion a license to an electric power supply company or other approved authority to construct and operate a hydro-electric power station in association with an irrigation scheme. Where such a license is granted the water made available for the generation of power will be under the control of the local irrigation authorities.

Where the construction of a hydro-electric scheme will not directly affect the use of water for irrigation, development will be carried out by an independent agency to whom the CWA will grant the necessary license.

Domestic and Industrial Supply

Supplies of potable water for domestic and industrial use shall be accorded precedence over all other uses. In some of the larger cities the entire cost of the water supply scheme will be met either by the municipality or by private capital. In such cases it will be optional for the municipality or company to request the CWA to undertake on its behalf the preparation and execution of the scheme. Should either elect to carry out the scheme, the party so electing shall be required to submit to the CWA for approval its proposals for obtaining a source of water if the latter is outside the municipal limits.

In the smaller cities and towns the local authority will possess neither the technical nor the financial resources to undertake a water supply scheme. In such cases it will apply to the CWA for technical and financial assistance to prepare a scheme to suit its needs. Subsequently it will apply to the CWA or to a bank for a loan to meet the cost of construction. Where applicable, interest on loans will be payable by the local authority from the date when the money is made available, but payments in respect to amortization shall not commence until the expiration of an agreed period after the scheme has come into service. In such cases the CWA will arrange for the construction either of the entire scheme of supply and distribution, or alternatively will carry out the supply scheme as far as the municipal limits beyond which the municipality will itself carry out the distribution scheme.

Water committees or companies will be formed by the municipalities or local authorities to undertake the operation and management of these water supply schemes after completion.

Water supply schemes for villages will normally be carried out wholly under the supervision of the CWA. Many village schemes will be carried out as extensions of local irrigation schemes, and the CWA will undertake responsibility for their operation and maintenance when requested to do so by the local people, until such time as suitable arrangements can be made for the scheme to be taken over by qualified local authorities.

The CWA will be empowered either to sell or to purchase wells, kanats, water supply schemes, or other sources of water.

River Training and Flood Protection Works

Where it is proposed to carry out river training or flood protection works within the municipal limits of a town or city, the municipality may request the CWA to undertake on its behalf the necessary investigation, planning and design. The cost of such works shall, however, be met by the municipality.

ORGANIZATION

The whole country will be divided up into a number of water districts, the boundaries of which will be defined by natural water sheds and will incorporate complete river drainage systems. The areas covered by each water district will be adjusted so that in general the ultimate water resources of each will be approximately equal. A district manager (an engineer) will be in charge of each area. He will have his own engineering staff and will be responsible for:

1. Collection of all statistics and information relating to the total water resources of his district. All information shall be recorded at the head office of the CWA.
2. Ascertaining the water needs of his district in consultation with the local agricultural officers.
3. Preparing all projects for submission to the head office of the CWA.
4. Supervision of the execution of all the approved projects in his district.
5. Operation and management of all schemes carried out in his district.

In Exhibit D-14 we have recommended tentatively four such water districts which would, in our opinion, serve to commence decentralization. It would not be advisable to start with too many districts. As work, commitments and trained personnel increase it will be possible to increase the number of water districts. There is no need whatever for water district boundaries to follow Ostan boundaries.

The district office will be fully qualified to undertake the preparation of projects, but where specialized knowledge and experience is required, or the amount of work to be undertaken is beyond the local resources, appropriate personnel will be seconded on a temporary basis from the head office. Should the resources of the head office be inadequate, additional staff will be recruited for the purpose.

The preparation of detailed designs, specifications and contract documents required for the execution of major works, shall be carried out at the head office of CWA, but the district office will be empowered to undertake such work in connection with minor schemes up to an agreed value.

Foreign Assistance

During the early years of planning and development it will be impracticable to build up sufficiently quickly the necessary number of experienced engineers capable of implementing the Seven Year Plan at the desired rate. To meet this difficulty two alternatives are available:

1. The recruitment of foreign engineers and specialists for a period of years.
2. The employment of foreign firms of consulting engineers to undertake the investigation, planning and supervision of the execution of specific schemes.

It will probably be found advantageous to employ both the above methods. The first method would provide the superior technical direction and the training of young Iranian engineers, and the second would relieve the load on the technical resources of the central office during the early years of its development.

Construction

When the execution of a project has been approved, a special supervisory construction division will be set up under the authority of the district manager who will, as already indicated, obtain the additional technical staff required from the head office of the authority. The latter will either provide secondary staff from its own resources or undertake special recruitment as may be necessary.

All construction work should be carried out by contract let on the basis of competitive tendering under adequate safeguards with regard to the fulfilment of the contract. Care should be taken to weed out all contracting firms, who, by reason of their inexperience, unsatisfactory financial standing or other causes, are not suitable to be entrusted with the work.

After completion of the work the supervisory construction division would be disbanded and the personnel transferred to other areas where their services are required. The permanent establishment of the district manager's office will be left to carry on with their normal administrative duties which will include the operation, maintenance and management of the schemes which have been completed.

Appendix D-2

APPENDIX D-3

DESCRIPTION OF IRRIGATION PROJECTS

The following pages contain a description of the present and proposed sites of irrigation projects which we inspected and concerning some of which engineering reports have already been prepared. The title of each project gives the project number, its name, the ostan location and the purpose of the project. The location of the sites is shown in Exhibit D-13. Members of the staff of Overseas Consultants, Inc. visited each one of these sites.

No. 1—KARAJ—OSTAN 2—IRRIGATION, WATER SUPPLY AND POWER

Description

The Karaj River rises in the Elborz Mountains at an elevation of over 3,000 m. During the spring and early summer the river is fed by the melting snows from the high ranges and in consequence the dry weather flow is maintained at a relatively high level.

Between Farvardin 1323 (April 1944) and Farvardin 1326 (April 1947) river gauging operations were undertaken by the Independent Irrigation Corporation (Irrigation Corporation), while in Bahman (February) of the latter year Sir Alexander Gibb and Partners set up a water level gauge at Pilaghan about 6 km above Karaj town, where they have since maintained daily observations.

Over the total period of record covering 4½ years, the mean annual discharge at Pilaghan has been computed at 12.7 cubic meters per second (cms). In the same period the maximum flow was 73 cms in Farvardin 1327 (April 1948), while the minimum discharge recorded was 3.5 cms in Shahrivar 1323 (September 1944). The latter figure, which represents 28 per cent of the mean, is unusually high for Iranian rivers and demonstrates clearly the equalizing effect of the snowfields from which the river derives most of its flow. The hydrograph of the river over the period is shown in Exhibit 18.

The catchment area above the gauging point includes about 1065 sq km and the average annual run-off over the period of gauging therefore amounts to some 380 mm. Over the same period the available records indicate that the annual rainfall at Karaj town averaged 393 mm. Unfortunately no information is available as to the precipitation over the higher portions of the catchment area, and it is therefore not possible to make any estimate of the run-off in relation to the total precipitation.

The Karaj is a short steep mountain torrent which descends nearly 340 m in a distance of 25 km between kilometer posts 31 and 6. The deep gorge through which the river has cut its course offers little opportunity of securing good reservoir sites, since at no point does it open out appreciably and lose its gorge-like character. It follows that, although the Karaj gorge provides a number of favorable dam sites, the cost per cubic meter of water stored is likely to be relatively high.

Comments

Of the sites which have been examined and surveyed by the Irrigation Corporation, the one located near kilometer post 23 appears the most favorable, but even here it would be necessary to build a dam not less than 110 m high, in order to store 70,000,000 cu m.

It seems doubtful whether the heavy expenditure involved by such a high dam could be justified by the increased dry weather flow which such a reservoir would provide. But no definite opinion can be given until a detailed economic study has been made.

The water from the Karaj can be used for:

Potable supplies to Tehran
Irrigation
Hydro-electric power.

Of these the potable requirements must be accorded first priority, any water abstracted for such purposes being permanently diverted and lost. Except therefore to the extent that it may be found possible to utilize purified sewage effluent in later years, it is only the residual flow, after meeting potable needs, which will be available for extending irrigation in the submontane tract. For the generation of hydro-electric power on the other hand, it will be possible to utilize the whole of the Karaj water, since the power station can be conveniently constructed above the point where the potable supplies are abstracted from the river. The uses of the river for power will thus not seriously conflict with its use as a source of domestic water supply for the city of Tehran.

The potential power resources of the Karaj are considerable. The average gradient of the river is 13.5 m per kilometer, which represents a continuous output of over 100 kw per cubic meter per second utilized over each kilometer length of the gorge. Thus, if the minimum discharge of the river is raised from 3.5 cms to 8 cms as a result of the provision of storage reservoirs, it would be possible to generate continuously 800 kw per kilometer. On this basis, therefore, the 25 km stretch of the river between kilometer posts 6 and 31 represents a potential continuous output of some 20,000 kw.

Being snow fed, the Karaj River, in comparison with the majority of Iranian rivers, is relatively free from silt. Nevertheless, both the rolling bed load and the material carried in suspension under flood conditions is likely to be appreciable and should not be ignored in considering the probable useful life of any reservoirs which may be built.

The river is well adapted to development in a series of stages permitting the available output to be gradually built up to meet the needs of an expanding market. The first dam to be built should provide at least sufficient control of the dry weather flow to meet the foreseeable requirements of Tehran. As further dams are constructed for power development, the dependable flow will be increased and will provide a surplus of water which can be used for irrigation purposes.

In this connection it should be noted that, owing to the steep gradient of the river, it is likely to be more economical to develop the head on the power station by driving a tunnel through the rock cliffs which flank the gorge, rather than to concentrate the river gradient by means of a high dam.

Recommendations

Both the character of the river and its proximity to Tehran render the Karaj a valuable national asset, the scientific exploitation of which should be accorded a high priority in any development program. The first step to be taken should be a review of the studies which have already been made by the Irrigation Corporation with the object

of drawing up a scheme for the stage-by-stage development of the river. In this connection it is most important to continue the river gauging operations which were initiated a few years ago.

No. 2—RIVER LAR—OSTAN 2—IRRIGATION, WATER SUPPLY AND POWER

Description

Detailed studies of the project were made a few years ago by Sir Alexander Gibb & Partners and will be found described in their report dated December 1945 (Azar 1324).

The proposals submitted by the consulting engineers may be considered as falling into four sections, as follows:

1. A dam in the Lar Gorge whence water would be led to a hydro-electric power station at Kalan having an ultimate capacity of 72,000 kw.
2. A dam at Latiyan at a site just below the confluence of the Jajirud and Rud-i-Lavorak, impounding a reservoir 5 km in length having a top water level of 1610 m above sea level and a gross storage capacity of about 72,000,000 cu m.
3. A tunnel from the Jajirud near Latiyan diverting water for irrigation development in the area lying northeast of Tehran.
4. Extension of Kalan power station to full capacity of 72,000 kw improving the Jajirud watercourse and developing irrigation in the Veramin Plain.

Comments

It is considered, both on technical and economic grounds, perfectly feasible to initiate the River Lar project by commencing construction of the Latiyan dam and attendant works which would result in improved irrigation of the Veramin Plain.

By carrying on these works the following advantages would be secured:

1. Elimination of the annual damage, estimated at Rls. 5,000,000, which is caused in the Veramin Plain by the unregulated discharge of the Jajirud.
2. A hydro-electric station could be located in the Jajirud valley either on the east bank of the river just below a dam at Latiyan or, by locating the station farther downstream, the output could be approximately doubled by driving a tunnel 2 km in length.
3. By canalizing the Jajirud, river losses would be reduced particularly during periods of low discharge and also damage to crops and property on the Veramin Plain would be prevented.
4. Storage provided by a reservoir located to collect the discharge of the Jajirud and the increased discharge down the Rud-i-Lavorak would enable fluctuations in daily power load to be smoothed out and water to be distributed efficiently between Tehran and Veramin Plain areas when the necessary works enable the former to benefit from the scheme as a whole.

The proposed dam site lies just below the confluence of the Rud-i-Lavorak with the Jajirud. This site fulfils the above requirements except that only partial control of abnormal flood discharge of the Jajirud would be possible. Trial borings have confirmed that the strata underlying the reservoir can safely be regarded as impermeable.

It has been estimated that with the storage provided in the reservoir 12,000 kw generating capacity could be installed at Latiyan.

The cost of the partial development of the Lar project, as envisaged above, has been estimated by the consulting engineers at Rls. 360,000,000 of which about 30 per cent would be in foreign currency. This would include access road, Latiyan dam, power tunnel, penstocks, power station, land and compensation, transmission line to Tehran with all contingent works and irrigation works in Veramin Plain.

Recommendations

In view of the magnitude of the project as proposed by the consulting engineers, the large expenditure involved, and the considerable period likely to elapse before the project as a whole becomes self-supporting, it is considered that the work should be carried out in stages and spread over a period of years. The investigations which have already been carried out would permit the first stage, the Latiyan dam and associated works, to be carried out at an early date. In view, however, of the time which has elapsed since the original investigations were made, it is considered that the project as a whole should be reviewed to permit advantage to be taken of the additional data and information which have since been made available.

No. 3—ABBAS-ABAD—OSTAN 2—IRRIGATION

Description

It is proposed to build a dam across a rocky gorge through which the Ghum River has cut its course at a point about 2 km to the west of the Ghum-Isfahan road. Good foundation conditions are provided by the hard crystalline rocks of which the sides of the valley are composed, and there is little doubt that a dam could be founded in the river bed at no great depth.

A contoured survey has been prepared of the dam and reservoir sites to the scale of 1:10,000.

Information has been provided by the Irrigation Corporation. The catchment area above the site of the dam is 12,000 sq km. The average discharge of the river in 1326 (1947) was 2.21 cms and in 1327 (1948) was 4.14 cms. Height of the proposed dam would be 35 m with estimated gross storage of 65,000,000 cu m. Average silt content of the river is 2 to 2½ per cent.

No survey has been made of the lands which would be commanded by the canal system, but it is understood that the area of arable lands below the dam site approximates 15,000 hectares.

Comments

The site selected appears to offer the opportunity of providing economical storage, but before any decision can be made it will be necessary to undertake studies of the agricultural benefits which could be secured.

The figures given for the silt content of the river appear to be abnormally high and this aspect requires careful investigation. On the basis of the figures given by the Irrigation Corporation the proposed reservoir would be completely silted up in about 30 years.

No. 4—DIMEH—OSTAN 10—IRRIGATION AND POWER

Description

It has been suggested that a storage reservoir should be built at the head of the Zayandeh Rud about 2 km below the village of Dimeh.

From surveys which have been prepared it is estimated that a dam 20 m in height would provide a gross storage of 32,000,000 cu m.

A general geological inspection of the area was made in 1325 (1946) on behalf of Sir Alexander Gibb & Partners by Sir Edward Bailey, who reported that the nummulitic limestone through which the gorge has been cut should provide quite satisfactory foundations for a dam, provided the rock was effectively grouted.

Comments

The Dimeh site is one of several which have been proposed for the regulation of the Zayandeh Rud, particularly for the storage of the water which will be diverted from the Karun after the Kuhrang tunnel is completed.

No decision should be taken with regard to the proposed Dimeh reservoir until the control of the Zayandeh Rud as a whole has been thoroughly studied.

Recommendations

Pending the completion of the Zayandeh Rud studies the following action should be taken:

1. Extend existing contoured surveys of the Dimeh reservoir site to an elevation of not less than 50 m above the river bed at the dam site.
2. Sink at least one trial bore on each bank of the river to determine the character of the rock in depth.
3. Study the general design of the Dimeh dam and prepare estimates of cost for varying heights.

No. 5—TANGI-GAZI—OSTAN 10—IRRIGATION AND POWER

Description

Three possible sites are available for the construction of a dam in the Tangi-Gazi area, and these were examined in 1325 (1946) by Sir Edward Bailey.

Before the most suitable site can be selected, or any attempt made to prepare reliable estimates, it will be necessary to carry out a drilling program to determine the depth of the valley fill and the course of the underlying limestone. The main engineering problem lies in the construction of an effective cutoff, and until close study has been made it will not be possible to reach any conclusion as to the cost of the storage which will be provided.

Contoured surveys of the reservoir site have been prepared from which it is estimated that a dam 30 m in height would provide a gross storage of about 120,000,000 cu m.

Comments

The Tangi-Gazi project, like that at Dimeh 10 km farther upstream, should be considered as part of an overall plan for controlling the waters of the upper Karun and the Zayandeh Rud.

The site may be considered as either an alternative or a supplement to the Dimeh and other storage reservoirs which have been proposed, but until an overall study of the problem has been made it will not be possible to decide either the order in which the reservoirs should be constructed or the amount of storage which should be provided.

Recommendations

Pending the completion of the Zayandeh Rud studies the following action should be taken:

1. Further geological investigations, including drilling, to determine the best location for a dam at Tangi-Gazi.
2. Subject to the above findings, preparation of designs and estimates for constructing dams of various heights.

No. 6—KHOSHUEH—OSTAN 10—IRRIGATION AND POWER

Description

The project envisages the construction of a dam some 40 to 50 m in height just above the village of Khoshueh where a narrow neck is formed by a ridge of cretacious limestone through which the river has cut its course. Upstream from the dam site the river flows in a narrow valley over a flat gradient, and it has been estimated that a dam 42 m in height would create a lake 19 km long and would provide a gross storage of 145,000,000 cu m. The creation of such a reservoir would inundate seven villages together with the orchards and cultivated lands which support them. The dam might be increased to 54 m height for greater storage, but the number of villages inundated would be 10.

A detailed contour survey of the dam site and reservoir area has already been made by the Irrigation Corporation, while a geological report was prepared by Dr. Mohammed Hassan Dehghan in December 1944 (Azar 1323). In this report Dr. Dehghan describes the basement rocks which underlie the site of the dam as liasic-schist, which is overlain by beds of cretacious limestone. The liasic-schist, which is probably to be found in the river bed beneath gravel deposits, should provide a satisfactory water-tight foundation for the proposed dam.

Comments

The site at Khoshueh is one of a number which have been proposed for the regulation of the Zayandeh Rud. As a site for a dam the topographical and geological features are favorable, and it possesses the advantage that it is relatively accessible from Isfahan. The real value of the site must, however, be judged in terms of the overall cost per cubic meter of water stored, and, in assessing this, account must be taken of the loss of good agricultural land by inundation and of expenditure incurred in expropriating and resettling the population now inhabiting the fertile strip of land which borders the river within the reservoir area, amounting to about 100 hectares.

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It is probable that eventually the control of the Zayandeh Rud will be effected by a series of reservoirs stretched out over a considerable distance from Dimeh to Chamasaman, but the selection of the first to be constructed must await a more complete investigation of the hydrology of the river and the carrying out of surveys of the areas which can be brought under cultivation.

The construction of a dam at Khoshueh would permit the generation of hydro-electric power within easy transmission distance of Isfahan, where a new thermal power station is now under construction. The output from the hydro-station would be variable, depending upon the head and the amount of water released for irrigation, but in association with the thermal station it would form a valuable additional source of supply.

Recommendations

Steps should be taken to examine the site of the dam by means of trial bores in order to prepare reliable estimates of the cost of constructing dams of several heights.

Hydrological studies should be started to determine the runoff characteristics of the river and the amount of silt carried.

The work should be carried out as a part of a general investigation to determine the order in which the reservoirs on the Zayandeh Rud should be constructed.

No. 7—CHAMASAMAN—OSTAN 10—IRRIGATION AND POWER

Description

There are several alternative sites available for a dam in the neighborhood of Chamasaman; of these, the uppermost appears most favorable.

No detailed survey has been made and until this has been done it will not be possible to make a comparison with the site proposed at Khoshueh which lies some 19 km farther upstream.

Comments

Between Chamasaman and Khoshueh the river is confined within a somewhat narrow valley which offers but limited opportunities for storage. It seems likely that the storage provided by a dam at Chamasaman will, for a given height, be somewhat less than that offered at Khoshueh. Moreover, the river at Chamasaman being wider than at the upper site, the dam is likely to prove the more costly of the two.

The geology of the Chamasaman site has been studied by Dr. Mohammed Hassan Dehghan and is referred to in his report dated December, 1944 (Azar, 1323). In this report Dr. Dehghan has described the underlying rocks which appear in the river banks as liasic-schist. These are overlain by cretacious limestone, and, while exhibiting considerable surface weathering, show no signs of the existence of cavities or solution channels. Surface examination indicates that foundation conditions are likely to be reasonably good, although no definite opinion can be expressed until trial bores have been sunk to determine the quality of the rock in depth.

The construction of a storage dam at Chamasaman would permit the water released for irrigation to be used for the generation of hydro-electric power, and the design of any works which may be undertaken should take this possibility into account.

Recommendations

A closer study, based on detailed surveys, should be made of the several possible dam sites available at Chamasaman, in order to determine whether they offer any economic advantages over that at Khoshueh.

Hydrological studies of the river made in connection with the Khoshueh project will be equally applicable to the Chamasaman sites.

No. 8—RAMJIRD—OSTAN 7—IRRIGATION

Description

Essentially the Irrigation Corporation's proposals are based upon the construction of a permanent diversion weir across the Kur River at a point some 7 km upstream from the village of Doroudzan. At this point there exist traces of an ancient dam constructed in lime rubble, the greater part of which has long since been swept away. The proposed weir would pond up the dry weather flow of the river sufficiently to feed an old canal which follows the right bank and which is still in use. This canal draws its water from the river at a point some distance upstream from the old site where a temporary brushwood diversion dam is constructed each year when the flow has fallen sufficiently low.

The objective of the proposals put forward by the Corporation are thus extremely limited and envisage little more than making the present primitive irrigation system more secure.

Comments

The Kur River rises at an elevation of over 3,000 m in the mountain ranges which lie some 150 km to the northwest of Shiraz. The catchment area above the site proposed for the diversion of the river covers about 8,000 sq km, the upper part of which is subject to a fairly high precipitation in the form of rain and snow. Although no attempt has been made to gauge the runoff, it is obviously very considerable and would, if properly conserved by means of storage reservoirs, provide ample water for extending irrigation in the Marv-dasht Plain.

The valley above the proposed location of the diversion weir opens into a large flat basin suitable for reservoir storage. The full use of this valley for storage purposes would entail the construction of a considerable dam, for which a possible site exists about 5 km downstream from the weir site. At this point the limestone sides of the valley converge and the rock is exposed on both sides of the river. Although heavily weathered on the surface, it is probable that satisfactory foundations could be obtained both in the river bed and on the banks at no great depth.

It is clear that the Kur River possesses great possibilities for the development of irrigation and should be examined as a whole with the object of drawing up an overall plan for its exploitation.

Like most of the Iranian rivers, the Kur carries considerable quantities of silt when in flood and the effect of the deposit of this silt burden within the reservoir area must be carefully studied.

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Recommendations

The Kur River is too valuable to be developed piecemeal by a series of small disconnected projects, the execution of which may lead to a wasteful use of its potentialities. The entire river system above Bandamir should be viewed as a single entity, and the first step should be the accurate mapping of the catchment area and the establishment of a number of permanent gauging stations. The lowest of these gauging stations might be at Bandamir itself, while others might be established near the main road bridge in order to measure the separate flows of the Kur and Sevard rivers. Further gauging stations should be established near the confluence with the river Main.

Only by a study of the river basin as a whole will be possible to plan logically the gradual development of its considerable resources. An adequate study of the hydrology of the river will necessarily take several years, and, until some preliminary data have been accumulated, it is not necessary to incur the expense of geological exploration and drilling at the site suggested for the dam on the upper reaches of the river.

The hydrological and other studies should be combined with an examination of the soils of the lands which could be brought under cultivation by a system of canals fed from the Kur River.

No. 9—DOROUDZAN—OSTAN 7—IRRIGATION

Description

The scheme is essentially an alternative to the Irrigation Corporation's proposals for the construction of a simple diversion weir at a point on the Kur River some 7 km upstream from the village of Doroudzan, which scheme is separately described.

The proposal is to construct a storage dam at a site lying between those now occupied by the remains of two ancient dams and to create a reservoir with capacity of some 400,000,000 cu m. The water stored would be used for irrigation in the plains through which run the lower reaches of the Kur River, and it has been suggested that by this means some 40,000 hectares might be brought under cultivation. On the basis of soil studies made in the area, the lands in question appear to be fertile.

Comments

Reference should also be made to the description of the Ramjird project, No. 8.

The development of the Kur River should await completion of topographical and hydrological studies. Until these are available no useful comment can be made on the proposal prepared by the Irrigation Corporation beyond the general observation that the river possesses great possibilities of large-scale irrigation development.

Recommendation

Plans for development should be drawn up only after a comprehensive study of the potentialities of the river system as a whole, and piecemeal development is to be strongly deprecated.

No. 10—MARV-DASHT—OSTAN 7—IRRIGATION

Description

A scheme has been proposed for the reconstruction of an ancient reservoir and irrigation system dating back to the days of the old Persian Empire. Essentially, the proposal is to divert the dry weather flow of the Main, a tributary of the Kur, at a point a few kilometers from the village of Band Baniyeke where there exists a small diversion weir built of rubble masonry which raises the river about 3 m and supplies a small irrigation canal.

In ancient times the water diverted from the Main River was stored in a reservoir near the village of Garmabad where the remains of the original earthen embankment are still to be seen. The old reservoir had a negligible catchment of its own and was impounded by a dam approximately 5 m in height and 2,750 m in length.

The Irrigation Corporation's proposal is to reconstruct this old dam to a height of 9 m which would probably entail a small cutoff dam across a low saddle.

The district lies in the limestone formation, the broad valley bottom consisting of fine alluvium which is relatively impervious. There are no special engineering difficulties in connection with the Irrigation Corporation's proposal, although it should be recognized that a certain amount of seepage from the reservoir will be unavoidable.

Comments

Some survey work has been carried out by the Irrigation Corporation engineers and it has been estimated that the proposed reservoir would have a capacity of 35,000,000 cu m. The Main River, however, has been gauged only on one occasion (during the winter) when the flow was stated to have been 5½ cms. No other records of flow exist, but for preliminary design purposes it has been assumed that a dry weather flow of 3 cms could be relied upon, and it is for this discharge that it is proposed to construct the diversion canal.

Except possibly under flood conditions, the Main appears to be virtually free from silt, and since it would be mainly the dry weather flow which would be diverted into the reservoir, the latter would not be appreciably affected by silting.

The proposal to store the dry weather flow of the Main in the manner suggested must be regarded as one of strictly limited objectives.

Recommendations

It is considered that the whole of the Kur River basin, including such tributaries as the Main River, should be studied with a view to drawing up plans for its development in the most effective and complete manner, and it is therefore recommended that the Marv-dasht project should not be proceeded with until an overall study of the Kur River basin has been made. This cannot be done until suitable maps are available, and their preparation is therefore a matter to which the earliest attention should be devoted.

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No. 11—BANDAMIR—OSTAN 7—IRRIGATION

Description

In the middle of the village of Bandamir there is an old rubble dam said to have been constructed in very ancient times, before the invasion of Alexander the Great, for the irrigation of Marv-dasht (Plain of Marve). The dam, which has a height of some 4 m, was originally constructed for storage purposes, but the reservoir has long since become completely silted up and now merely serves the purpose of raising the level of the river so that it may command the lands which lie downstream from the village.

The dam is now in very bad condition and requires constant repair. There is serious risk that a large flood might result in its complete destruction and the loss of the irrigated land on which the village now depends. A primitive roadway is carried across the top on rough masonry arches.

Proposals have been drawn up by the Irrigation Corporation to replace the present structure with a modern one at a cost of Rls. 1,000,000. The proposals envisage the preservation of the existing irrigated land, and it is anticipated that when more water becomes available as a result of the construction of storage reservoirs on the upper reaches of the Kur River it will be possible to add a further 500 hectares. The area of land at present irrigated is said to comprise about 1,000 hectares (no exact information is available).

A number of primitive corn mills are operated by the head of water created by the existing dam, and it is said that during the dry weather there is enough water both for milling and for the servicing of the canals which take off from either bank just above the village. The control of the water to these canals is most primitive, and consists of merely plugging up the entrance to the canals by dumping earth.

Comments

The scheme is one of limited objectives, and has mainly been put forward in view of the fact that the loss of the present decrepit structure would bring disaster on the local population. Technically there are no special difficulties in building a new dam, but, the foundations being of alluvium, precautions will have to be taken to ensure freedom from excessive percolation and the risk of downstream erosion under flood conditions.

There are obvious possibilities of combining the new barrage with a small hydro-electric scheme which would supply the local village industries, of which corn milling is one of the most important.

Recommendations

Detail surveys of the site of the present dam and the cultivable land downstream should be put in hand at once with a view to drawing up detailed designs for a new structure. It will probably be found most convenient to locate the new structure downstream and entirely clear of the old works in order to avoid interference during construction.

It is likely that the sum which has been allocated for the work by the Irrigation Corporation will be found inadequate, but no reliable estimate is possible until proper surveys and designs have been prepared.

No. 12—DASHT—OSTAN 7—IRRIGATION

Description

The scheme envisaged by the Irrigation Corporation is based upon using the unregulated flow of the Mund River for the extension of winter irrigation in the Dasht Plain over which the river meanders after leaving the foothills. It is proposed to construct a diversion weir just below the entrance of the limestone gorge near the point where the river debouches onto the plain. This weir would provide no storage and would merely serve to control the admission of water at the head of the canal on the right bank.

The main canal, which would follow a very difficult alignment, would have a total length of some 80 km. Over the first 4.5 km the water would be conveyed through a tunnel driven through soft and friable limestone. This tunnel would be an expensive feature since, apart from the possibility of leakage, it is probable that it would require permanent lining over at least part of its length. The open canal itself would also lead to very expensive construction since, over the upper section, the alignment would follow a sinuous course along the foot of the irregular hills which flank the Dasht Plain.

It is proposed that irrigation of the lands which lie on the left bank of the Mund River should be effected by splitting the right bank canal at a suitable point and conveying a part of the water over to the left bank by means of an aqueduct.

Comments

The total catchment area lying above the site of the diversion weir is about 40,000 sq km but no reliable information is available with regard to the regime of the river or the quantity of water discharged. Very rough estimates which have been made by the Irrigation Corporation suggest the following figures:

Normal summer flow	6 to 8 cms
Normal winter flow	20 cms
Maximum flood flow	1,500 to 2,000 cms

It is proposed to design the right bank canal for 20 cms and to irrigate 30,000 hectares on each side of the river.

Survey work in connection with the diversion weir and the right bank canal was undertaken during the cold weather of 1327-1328 (1948-1949). In addition some soil sampling has been done in the Dasht Plain together with gauging of the winter flow of the Mund River.

It is said that during the dry weather the water of the Mund River where it enters the Dasht Plain is saline and unfit for irrigation purposes. The benefits of the scheme will therefore be limited to increasing winter cultivation. The capital cost of the canal system is likely to be high and the water supplied to the cultivators will, therefore, be expensive.

The Dasht Plain is sparsely populated and local sources of information suggest that it will not be possible to find more than 1,000 agricultural workers in the whole district. With present methods of cultivation, the maximum area of irrigated lands represented by this labor force is 4,000 hectares as compared with 60,000 hectares contemplated

by the projected scheme. It is not clear from what sources the greatly increased population, which would be necessary to justify an irrigation scheme on the scale contemplated, are likely to come, and the problem is aggravated by the general lack of security in the district, which at present makes it unattractive as a settlement area.

Recommendations

For the reasons set out above it appears difficult to justify an irrigation scheme of the magnitude contemplated, particularly having regard to the limitations imposed by the salinity of the water during the dry weather. It is suggested, therefore, that consideration be given to the possibility of undertaking a smaller scheme with more limited objective better fitted to local conditions.

Further extensive studies of such problems as river flow, silt content and chemical quality of the river water at different times of the year are essential before any decision can be reached.

No. 13—KARUN—OSTAN 6—IRRIGATION, FLOOD AND SILT CONTROL, POWER AND NAVIGATION

Description

The Karun is the most important river in Iran. It rises among the mountain ranges to the west of Isfahan and after following a broken and twisting course through wild gorges and upland valleys debouches from the hills to the north of Shushtar and turning south pursues a winding course over the alluvial plain of Khuzistan, until it joins the Shatt-el-Arab at Khorram-shahr.

The catchment area of the Karun comprises over 50,000 square km, the mean annual discharge at Ahwaz being estimated at 657 cms.

In the Shushtar area irrigation by gravity of between 4,000 and 5,000 hectares is carried out by means of a canal which takes off just above the remains of the old barrage on the Shutait branch of the Karun River.

There is a small hydro-electric plant of 100 kva on the Gargar branch of the Karun and it is proposed to extend this to 3000 kva. It is planned to use a part of this power to pump water into the existing canal system for the irrigation of a total of 25,000 hectares, for which the land is eminently suitable.

In the Ahwaz area there is a gravity irrigation scheme from the Chavour river which runs between the Karkheh and the Karun rivers. The Chavour rises from springs near Suss and consequently is not liable to flooding. The average flow available is 10 cms while the minimum is about 7 cms. The maximum area which could be irrigated by this system is 16,000 hectares, while at present only about 5,700 hectares are under irrigation.

In addition to the above there is a pumped irrigation scheme which draws about 3 cms of water from the Karkheh at Hamidieh and irrigates some 2,500 hectares. A further area extending in all to about 500 hectares is irrigated from the Karun river by a number of privately-owned pumps.

It has been stated that the land around Ahwaz is somewhat salty and for this reason not very suitable for irrigation. Any extension to the irrigation in this area

should be combined with a drainage system to keep down the level of the water table, and it may be necessary during the early years of cultivation to choose crops which will reduce the salt content of the soil.

Comments

In 1323 (1944) a British engineer made an extensive study of the possibilities of reviving, with modern methods of exploitation and construction, the irrigation system of Khuzistan which existed in ancient times. These studies, which were carried out during the War, were necessarily of a somewhat preliminary character, but led to the conclusion that by building a large dam across the Karun north of Shushtar very important benefits would be secured.

We do not think we can do better than quote the following conclusions which were arrived at as a result of the 1944 investigations:

"1. That a reservoir with a capacity probably not less than 3,750,000,000 cubic metres can be formed on the upper Karun by closing the gorge north of Shustar with a dam approximately 300 metres long and 50 metres high.

"2. That the reservoir would

a. provide protection on the Karun and Upper Shatt-el-Arab against abnormal floods such as those of 1275 and 1303 (1896 and 1924).

b. reduce the annual silt deposits in the estuary by approximately half.

c. provide approximately 30,000 kilowatts potential hydro-electric power.

d. be able to irrigate the Daimchah area, estimated as 22,000 hectares.

"3. That in conjunction with ancillary works of the Ab-i-Diz, the Karkheh and the Ab-i-Gargar and with hydro-electric pumping the reservoir would

a. be able to irrigate some 500,000 hectares without detriment to navigation on the Karun or the date plantations on the Shatt-el-Arab.

b. increase the reduction of the annual silt deposits in the estuary by approximately another fifth, making the total reduction approximately 70 per cent.

c. provide protection against abnormal floods on the Karkheh.

"4. That owing to the obstruction caused by the flow of the upper Shatt-el-Arab by the flood discharge of the Karun, the effect of the dam and ancillary works in reducing the Karun flood discharge would be

a. a reduction of the area annually flooded by the Tigris and Euphrates such that the water recovered from evaporation losses would be approximately equal to the difference in the Karun discharge, the Shatt-el-Arab discharge thereby remaining approximately the same.

b. a lowering of the mean high water level in the Iraq delta such that 100,000 to 400,000 hectares would ultimately be reclaimed.

c. a lowering of the water level in the Shatt-el-Arab above the mouth of the Karun during the flood season only.

"5. That the dam and ancillary works would have practically no effect on either the discharge or the water levels in the Shatt-el-Arab below the mouth of the Karun."

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It was further stated in the report from which the foregoing quotation has been taken that a lengthy study would be required to ascertain the value of the proposals for the promotion of agriculture in Khuzistan, but that the immediate advantages that would result from the construction of the dam as a first stage were fairly obvious.

Khuzistán is one vast flood plain subject about once every 25 years to catastrophic floods such as those of 1275 and 1303 (1896 and 1924). Since the last one in 1303 the railway lines from the Caspian Sea to the Shatt-el-Arab and the Persian Gulf have been laid through the flood plain, and the road from Andimishk to Khorram-shahr has been constructed. A flood such as that of 1303 would probably completely destroy the section of the road between Ahwaz and Khorram-shahr, besides doing great damage to the railways.

Even the 1322 (1943) floods, which were not abnormally high, did some damage to both the road and the railway, and it would appear that their ultimate preservation will depend upon the flood control which the Shushtar dam would provide. Including date plantations at the Shatt-el-Arab, livestock and crops, the capital cost of the damage done by a catastrophic flood to-day would probably exceed the capital cost of the dam, besides causing great loss of human life.

The proposals envisaged above are clearly on a very large scale and will entail heavy capital expenditure. For this reason they must be regarded in the character of a long-term project, but their potentialities are so great that we consider they are worthy of the closest study.

Recommendations

We recommend, therefore, that during the course of the Seven Year Plan steps should be taken to carry out surveys, prepare maps of the lands which may be brought under cultivation, and study the suitability of the soils for various types of crops.

Another aspect of the scheme which should not be overlooked is the availability of labor to undertake not only construction but also the cultivation of the land which would be made available for cropping. In addition the possibility of developing markets for the produce requires study.

The Khuzistan plains would appear to be well suited to the practice of mechanized agriculture, which would go a long way towards solving the labor problems, and this aspect must be given the closest study at the same time as the soil and other surveys are being carried out.

Bulk demands for power could only arise from the development of industrial loads. With the exception of a cement industry it is difficult to foresee such industries in the near future. But, with the expansion of agriculture on a large scale and the increase in electric demand from the oilfield areas, it may not be long before the hydro-electric possibilities of the area become attractive.

The Karun river system offers great possibilities for multi-purpose development of its water resources, and we therefore recommend that extensive studies be carried out at an early date covering the entire catchment area, and that special attention should be given to the conclusions arrived at in the 1944 report as quoted above. Early priority has been given to the mapping of the catchment areas, as indicated in the section on surveying and mapping in this volume.

No. 14—REZAIYEH—OSTANS 3 AND 4—IRRIGATION

Description

The present water supply is obtained from an open jube which takes off the Berdesur Rud at a point 5 km southwest of the town. The flow of the river is perennial but much reduced in the summer.

A proposal has been made to construct a dam on the Berdesur Rud for the storage of water, but owing to the character of the valley the construction of an effective cutoff would be expensive, and it is not recommended that the project should be proceeded with until a detailed geological examination has been satisfactorily completed.

Comments

At a depth of about 15 m, there is a considerable subsoil flow along a buried channel which runs parallel to the river, and it is considered more economical to pump this water into the existing jube by means of a low-lift, high-capacity pump. It is possible that the use of the subsoil water would make it unnecessary to construct a dam and storage reservoir.

Recommendation

It is, therefore, recommended that investigations should be initiated at an early date in order to ascertain the amount of water which it would be economical to extract in this manner.

No. 15—MANJIL—OSTAN 1—IRRIGATION AND POWER

Description

It is proposed to build a dam across the Sefid Rud immediately below the road bridge at Manjil at a point just downstream of the confluence of the Qizil Owzan and the Shah Rud. At the site selected the open valley converges to a narrow neck formed by an igneous intrusion of porphorite through which the river has cut its course.

No detailed geological study of the site has been made, but there is little doubt that it will prove eminently suitable for the construction of an important dam. The possibility that the river follows a fault line should not, however, be overlooked.

The primary object of the scheme is the storage of water for irrigation purposes in the fertile plain around Resht, where a shortage of water is experienced during the summer months.

The combined valleys of the Qizil Owzan and the Shah Rud offer the opportunity of creating large scale storage, and it has been suggested in a report prepared by the Irrigation Corporation that the construction at Manjil of a dam 60 m high would create a storage reservoir of some 1,000,000,000 cu m capacity.

The concentration of head created by such a dam would permit the water released for irrigation purposes to be used for the generation of electric power, and the possibility of increasing the available head on the power station by using a tunnel to develop the gradient of the river below the dam should be carefully explored.

In addition to providing irrigation and power the proposed reservoir would serve to control the floods in the Sefid Rud, which at present cause considerable loss and inconvenience every year in the lower reaches of the river, particularly in the neighborhood of Resht.

It is understood that no detailed survey has yet been made of either the reservoir site or the catchment area as a whole. It may be said, however, that examination of the existing ¼ inch to the mile maps indicates that the catchment area extends to approximately 65,000 sq km. It is further understood that no reliable estimate has been made of the area of the land which could be irrigated, although the departmental report already referred to has suggested that this might be of the order of 40,000 hectares.

Comments

The project outlined above is a very important one and possesses great possibilities for bringing under regular cultivation a large and fertile tract of country at present dependent upon an irregular rainfall supplemented in part by a primitive system of canals.

The project could readily be combined with the generation of a considerable block of hydro-electric power for which a market is already available in the thickly-populated and prosperous districts which border the Caspian Sea and which already possess a number of important industries. In this connection the use of electricity for pumping purposes should be kept in mind, since the value of much of the low-lying land which borders the Caspian could be greatly enhanced by a proper drainage system.

When in flood the Sefid Rud carries considerable quantities of silt in suspension and the effect of the silt upon the life of the proposed reservoir at Manjil must be carefully examined.

Below Manjil the Sefid Rud is confined to a gorge-like and steep-sided valley for a distance of some 10 km before flowing through a relatively wide plain. The location of the canal offtakes therefore requires consideration, since it may be found most economical to construct an independent diversion weir some distance downstream from the projected power station in order to reduce the cost of canal construction. Only detailed surveys will indicate the best course to adopt.

In addition to the proposed dam site at Manjil the feasibility of creating other storage reservoirs on the Qizil Owzan and the Shah Rud should be examined. In this connection the possibility of constructing a dam at Mianeh on the upper reaches of the Qizil Owzan has been suggested and there is no doubt that the accurate mapping of the basin of the Sefid Rud will indicate other possibilities which may be considered as further stages in the eventual control of the whole river system.

Another plan proposes diversion of part of the flow of this system into the Shur River Valley to the south. Great flat tracts of land exist between Kazvin and Karaj, which land would appear to be ideally suited for mechanical cultivation and which is inadequately watered by the Shur River flowing down the center of the valley to discharge into the Daria Namak near Ghum. The obvious solution here is to study the possibilities of this land being watered by means of a tunnel from one of the tributaries to the Sefid Rud, the Shah Rud (Talaghan River).

It is estimated that, provided a suitable diversion site can be found in the Talaghan Valley, it should be possible to divert approximately 20 cms of water from a catchment

area of about 1,000 sq km. The run-off per square kilometer in this area is estimated to be higher than the run-off of either the Lar or Karaj Valleys, as can be seen from the precipitation map. The catchment area being situated on the weather side of the Elborz range would have a higher precipitation than either of the foregoing catchments and there would be no great losses; consequently the run-off per square kilometer would be greater.

It is estimated that there is more land available than could be irrigated by the total waters of the Talaghan, and the selection of land to be utilized would depend entirely on soil surveys and agricultural conclusions. In the first instance it would be necessary to select an area of about 30,000 hectares for cultivation under such a diversion scheme.

One great advantage of this scheme would be that it would be located adjacent to excellent road and rail communications and near enough to the capital city to make a major contribution to the economy of the area.

Recommendations

Early attention should be given to the detailed investigation and planning of a long-range project to control and utilize the waters of the Sefid Rud for irrigation, flood control and electric power. The benefits which would follow the effective control of the river would be immense, and no scheme would be undertaken until a general examination of the whole drainage basin of the Sefid Rud has been made.

The first step to be taken is the gauging of the river at Manjil, where the existing road bridge offers an ideal opportunity for carrying out current meter observations. The latter must be combined with a continuous record of water levels, and a permanent gauge post should be set up forthwith. As soon as possible this gauge post should be supplemented by the installation of an automatic water level recorder. Discharge observations should be combined with regular silt measurements and carried out systematically over a number of years in order to build up a body of reliable statistical data on which detail plans can subsequently be prepared.

The study of the river discharge must be accompanied by the preparation of contoured maps of the whole river basin, and these should be extended to cover the cultivatible plain around Resht and the mouths of the Sefid Rud.

As regards the Kazvin (Talaghan) scheme, it is recommended that this area be studied with a view of diversion of the Talaghan waters by means of a tunnel to the Kazvin plains, and that agricultural and soil surveys of the areas to be commanded should be undertaken at the same time.

No. 16—SAVEH—OSTAN 1—IRRIGATION

Description

It is proposed to replace an ancient dam known as the Shah-Abbasi Dam by a modern structure.

The old dam which was built of lime rubble masonry occupies an excellent site in a narrow limestone gorge. It is in a state of decay and the river which has cut its way beneath the base of the dam now flows down its original bed in the gorge. Immediately

upstream from the dam site the valley opens out into a wide plain, affording a good reservoir site which drains a catchment area said to include some 12,000 sq km.

The present proposal is to build a dam 45 m high and to store 52,000,000 cu m. Provision would be made for raising the dam to a height of 52 m in order to increase the storage to 77,000,000 cu m.

Comments

The project has already been the subject of investigation and report by an independent consulting engineer whose services are still retained by the Irrigation Corporation. It is understood that arrangements are being made to commence construction at an early date.

No. 17—AKLAMAD—OSTAN 9—IRRIGATION

Description

There is an ancient dam constructed in rubble masonry and lime mortar, about 250 m long and 20 m high. The dam has been solidly built between limestone abutments and has three brick piers on the upstream face through which the water was released.

The reservoir has now silted up to within 5 m of the top of the dam, but owing to breaks at the bottom of the brick piers considerable erosion has taken place of an otherwise excellent arable area formed by the bottom of the old reservoir.

It has been suggested by the Irrigation Corporation that the old dam should be repaired and its height raised in order to restore the effectiveness of the old reservoir.

Comments

There is a large sub-soil flow beneath the dam, and it is evident that the original foundations were never carried down to solid rock. The dam could not be made watertight except at great expense, and since the reservoir area is so heavily silted up, it is not considered that the limited amount of storage now available would justify the expenditure. Exhibits 25, 26 and 27 are photographs illustrating the present situation.

It would not be wise to attempt to increase the storage by raising the height of the old dam.

Recommendations

It is suggested that the opening through the old brick piers should be reconstructed in such a way as to afford control of the water level on the upstream side of the dam. If this were done it would permit the channels which have been eroded through the reservoir bed to silt up to the general level of the alluvial plain, which could thus be brought into use for cultivation. Below this dam site the valley opens out and there is, unfortunately, no other site lower down. Economical development of water resources in this valley can be achieved only by extracting sub-soil water.

No. 18—GULISTAN—OSTAN 9—IRRIGATION

Description

This ancient dam was constructed across the Torghbin Rud, a non-perennial tributary of the Kashaf Rud. The original structure, which consists of lime rubble with an outer skin of brickwork, was never carried down to an impermeable foundation, with the result that there is now serious leakage of water beneath the dam. The structure is about 110 m long and 14 m high. The river bed upstream from the dam has a slope of approximately 10 m per kilometer.

Comments

A preliminary geological survey of the dam site and reservoir has been carried out by Professor Asfia. One side of the reservoir is pervious, and if the dam is repaired and raised percolation would probably result.

One section of the dam is founded on granite, and before the dam is raised it would be necessary to ensure that a proper cutoff to solid rock is constructed.

To restore the usefulness of the site as a reservoir it will be necessary to build an entirely new structure, for which purpose the site appears to be suitable physically. The valley which opens out above the present dam offers opportunity for considerable storage, although in the absence of detailed contour maps it is not possible to estimate the storage provided by a dam of the given height. But in view of Professor Asfia's geological report it is obvious that a careful study should be made of the site.

Recommendations

Before any definite plans can be prepared for the replacement of the present dam, the following steps must be taken:

1. Preparation of a detailed survey of the dam site and reservoir area. The former should be sufficiently extensive to cover other possible alternative sites which might be considered for the new dam, and for alternative heights of dam to be compared.
2. Continuous gauging of the river to be commenced in order to provide the essential information on which to decide the amount of storage to be provided, including silt gaugings.
3. Geological study of the site to be continued including the borings necessary to determine the quality of the rock in depth.
4. Preparation of surveys of the lands which could be brought under cultivation from the water stored in the reservoir, and chemical analyses of the water and of soil samples in the areas to be irrigated.

No. 19—TORUGH—OSTAN 9—IRRIGATION

Description

There is an ancient dam situated in a deep gorge of the Torugh Rud, a tributary of the Kashaf Rud, some 15 km from Meshed. The dam is about 18 m high, and was constructed of rubble in lime mortar, faced on both sides with brickwork. Originally constructed for irrigation, the reservoir is now badly silted up, and is practically useless

for storage purposes. It is estimated that the present capacity does not exceed 2,500,000 cu m.

The catchment above the dam is considerable and the site of the old structure is, subject to geological examination, suitable for the construction of a modern dam, and could be utilized for the creation of a considerable reservoir for the irrigation of the fertile plain east of Meshed. It may, however, be preferable to construct a new dam on a site lower downstream.

Comments

Although a few isolated measurements have been made of the flow past the site of the dam, no reliable information is available as to the total run-off and silt content, and it is not possible to make any suggestions as to the size of the reservoir which should be provided or the amount of water which could be made available.

It is unlikely that any use can be made of the old dam structure in rehabilitating the reservoir.

Recommendations

We recommend that the following steps should be taken:

1. Prepare detailed surveys of the dam site and reservoir area. These should be sufficiently extensive to cover possible alternative sites which might be considered for the new dam, and for alternative heights of dam to be compared.
2. Continuous gauging of the river to be commenced in order to provide the essential information for deciding the size of dam which should be built, including silt gaugings.
3. A thorough geological survey of the reservoir and possible dam sites to be carried out in order to determine the suitability or otherwise of the project.
4. The lands which could be brought under cultivation as a result of the construction of a new reservoir should be surveyed and soil surveys carried out including chemical analyses of the water.

No. 20—SHESH-TARAZ—OSTAN 9—IRRIGATION

Description

Before entering the plain which extends east and south of Kashmar, the Shesh-Taraz River passes through a narrow gorge with a bottom width of about 45 m. The sides of the gorge are approximately 100 m high and consist of conglomerate and sandstone. After leaving the gorge, water is taken off from the river for irrigation purposes by a number of channels.

Although no information is available with regard to the river flow, it is likely from the character of the catchment area and the high altitude of the mountains by which it is surrounded that the dry weather flow will be relatively high.

Comment

Subject to a geological examination, the site appears to offer a favorable opportunity for creating a considerable storage reservoir, and since the plain below the river gorge is large and well populated, there is little doubt that there is ample scope for extending the present limited irrigation.

Recommendations

Steps should be taken to keep a continuous record of river discharge under all conditions of flow, and, when sufficient information has been accumulated, the scheme should be considered in greater detail.

No. 21—SALAR RIVER—OSTAN 9—IRRIGATION

Description

The Salar River rises in the mountain ranges which lie to the east of Turbat-i-Haidari. Before debouching on to the plain of Salar, the river passes through a narrow gorge which has a width at river bed level of about 25 m. The sides of the gorge are approximately 30 m high and consist of sandstone rock much weathered and shattered on the surface.

The dry weather flow of the Salar River is at present used for irrigation, but the cultivation of the Salar plain is limited by a shortage of water.

Comment

No records of the river flow or other information appears to be available. Subject, however, to a geological examination, it appears that the gorge would provide a suitable site for a dam and that the project is worthy of further study.

Recommendations

Hydrological studies should be undertaken as soon as possible, followed by investigations relating to possible dam locations, and storage studies.

No. 22—SISTAN—OSTAN 8—IRRIGATION

Description

A few meters after crossing the Afghan-Iran frontier the Hirmand River divides into two channels, the Paryan Rud and the Sistan Rud. The latter has for many years occupied the deeper channel, and every year a temporary brushwood and earth dam has been erected for the purpose of dividing the waters of the Hirmand River in the proportions of Paryan one-third and Sistan two-thirds.

It was customary to make this dam from tamarisk brushwood, which at one time used to grow in the neighborhood in large quantities. The nearest remaining plantations are now, however, over 40 km away.

In 1327 (1948) the flow in the Hirmand River was exceptionally low and famine resulted. Last winter was a year of abnormal flood, and in consequence the irrigation area fed by the Sistan Rud was flooded, destroying most of this year's crops.

Comment

The problem is, therefore, to divert, as soon as the floods subside, one-third of the summer flow into the Paryan and to control the remainder in the Sistan so that it can be diverted into the existing irrigation channels.

It is clearly impossible to do any work over the Afghanistan frontier, and it is, therefore, impracticable to carry out any training works on the Hirmand River itself.

Another brushwood dam on the Sistan River would, even if the wood could be obtained in sufficient quantity, be expensive. Until a survey of the area in which the Hirmand River divides is available, no permanent proposals can be made, but in order to relieve immediate distress in Sistan every effort should be made to divert the Hirmand flow into the Paryan.

Recommendations

Arrangements have already been made by the Irrigation Corporation to prepare a survey of the area, and as soon as this becomes available, proposals for a permanent weir on the Sistan Rud should be examined.

No. 23—BAMPUR—OSTAN 8—IRRIGATION

Description

Except during periods of flood the bed of the Karvanda Rud is apparently dry until it has turned east to the south of the town of Iranshahr. Below this point water reappears in the river bed which is here much narrower and is sunk about 10 m below the valley floor. The quantity of water increases over the 20 km length of the river to Bampur.

Temporary weirs of earth and brushwood are built each year over this stretch of the river, and irrigation channels are taken off from both banks. Of these weirs the most important is known as Bampur and impounds a lake about 1 km in length with some 4 to 5 m depth at the lower end.

Comments

Because of the location of the present channels and the fact that subsoil water issues over a considerable length of river bed, a single weir would not utilize all the water available. Since the upward flow of the subsoil water is perennial, the problem of providing irrigation water is one of diversion rather than impounding, and of replacing the present temporary weirs with more permanent structures.

Recommendations

Consideration should be given to the possibility of designing a permanent type of weir which would resist the destructive effects of the annual floods. The selection of suitable local materials will be a difficulty, and it may be necessary to use concrete.

No. 24—JIROFT—OSTAN 8—IRRIGATION

Description

The Halil Rud is perennial and draws its water from the high mountain ranges. The river is at present used for the irrigation of the fertile plain which lies immediately south of Sabzavaran, where it is joined by two tributaries, Rud-i-Malanti and Rud-i-Shur.

Comments

The gorge through which the river has cut its course consists of conglomerate and sandstone and, subject to a geological examination, it appears to offer a suitable site for a dam. No records of river flow appear to be available.

Recommendations

In view of the great benefits which would undoubtedly be conferred upon the well-populated villages which are scattered over the plain, it is recommended that steps should be taken to study the possibility of expanding irrigation from the Halil Rud by creating a storage reservoir. In this connection the possibility of generating hydro-electric power should not be overlooked.

No. 25—RAFSINJAN—OSTAN 8—IRRIGATION

Description

A site has been suggested for the construction of a dam where the river passes through a narrow gorge between cliffs some 60 m in height and providing a width at river bed level of 15 m.

Comments

The construction of a dam at the site suggested would be expensive, and, since the valley which lies upstream offers little storage, the proposal is not attractive.

Below the gorge the river debouches on to a plain, which, owing to scarcity of water, is thinly populated and poorly cultivated. The water table at Bahramabad is some 30 m below ground level, and, since it is believed to be brackish, the possibilities for affording increased water supplies for irrigation in this area are not promising.

Recommendations

It is particularly recommended that a thorough survey of underground water resources should be undertaken at an early date.

APPENDIX D-4

COMPARISON OF COSTS: KANATS AND TUBE WELLS

The output and dimensions of kanats vary widely, but a typical example dug in average soil might be assumed to have a length of 4,000 m of which 2,000 m would require lining, a depth of mother-well of 30 m and an output of 30 liter per second (lps). Such a kanat would cost about Rls. 1,000,000 to dig and Rls. 26,000 annually to maintain. About half its annual output, amounting to 500,000 cu m, is wasted in the winter period.

A tube well of comparable output for irrigation purposes is decidedly small and uneconomic; efficient practice would call for a pump capable of handling the full capacity of the well. Typical examples of small and large pump wells are described below. Operating costs are figured for one-half year only for summer irrigation.

A well with 6 in. pump and output of 32 lps would cost about Rls. 500,000 completely installed, including Rls. 50,000 for transport of the drilling rig and equipment to the site. If it is equipped with strainers instead of slotted casing and slow speed prime mover, which is the preferred construction, it would cost about Rls. 600,000. With gas oil at its present price of Rls. 2.35 per liter and attendant at Rls. 133 per day, the operating cost would approximate Rls. 82,000.

A well with 10 in. pump and output of 150 lps would cost completely installed with the best equipment about Rls. 1,150,000 and the operating cost would be about Rls. 280,000.

Estimated water costs obtained by the above installations are tabulated below, followed by a listing of actual water prices in various areas for comparison. The value of water varies not only between districts but also inside small areas, the price near a large town often being several times that in effect 10 to 15 km away, but the prices shown are believed to be typical.

Estimated Water Costs

		Annual Costs in Thousands of Rials				Cost per liter per second per Annum in Rials
	Output in liters per second	Interest on Capital at 6 per cent	Depreciation at 5 per cent	Operation and Maintenance	Total	
Average kanat	30	60,000	—	26,000	86,000	2,867
6 in. pump well	32	36,000	30,000	82,000	148,000	4,625
10 in. pump well	150	69,000	57,500	280,400	406,900	2,713

Actual Water Prices

Area		Basis of Price	Price per liter per second per annum in Rials
Khorassan		A per annum charge of Rls. 50,000 per sang of 15 liters per second	3,300
Kashan-Yezd		Winter consumption charges	3,600
		Summer consumption charges	9,400
Other	Minimum	—	3,000
	Maximum	—	12,000

From the above it can be seen that, on the basis of capital cost and operation, tube wells can supply water at an economic rate. With increase in the number of wells in any

area, capital costs should be reduced. If wells are close together it should be possible to reduce attendant costs even if the pumps cannot be operated electrically. With fuel representing 35 per cent to 58 per cent of the overall cost per liter in the two examples, any reduction in fuel costs or fuel tax would bring important savings and encourage irrigation from tube wells.

In Appendix D-7 a typical draft specification for tube wells has been given, taking into account the necessity for holding the costs as low as is consistent with satisfactory operation.

Appendix D-4

APPENDIX D-5

TYPICAL EXAMPLE OF POSSIBLE DEVELOPMENT OF SUBSOIL WATER IN A SUBMONTANE VALLEY

As soon as it has been established that the aquifers in any area are suitable for development by pumped wells, the area as a whole should be examined and a co-ordinated plan should be prepared, avoiding the present lack of system with regard to kanat development in which efficient use cannot be made of the available subsoil resources. At present, one old and inefficient kanat may deny development to the best part of an area, and what should be the best source of water may run to a kavir or to the sea and so be wasted. A planned development and control can prevent the over-pumping of aquifers and the consequent additional cost of pumping, due to lowered water table, and the eventual reduction of output from all wells.

The Meshed Valley appears to give ample scope for the development of a co-ordinated water development scheme, and the valley of the Kashaf Rud has therefore been taken as a suggested basis for study.

This valley from the upper watershed near Chineran to the outfall into the Hari Rud is approximately 260 km long and the floor of the valley is about 15 km wide. The valley contains a very large spring, the Chashmeh-Gilas; large kanat developments at Gunabad and also north-west of Meshed; a river bed, perennial through portions of its course; and a number of side valleys containing good springs as well as flows below the river bed. There is a large demand for water both for the city of Meshed itself and also for a large agricultural area in which only one-third of the irrigable area is at present supplied.

The annual precipitation in the valley averages only 250 mm, but the snowfall on the surrounding mountains is considerable and that on the Hezar Masjid range, which is largely limestone, appears to supply a large portion of the subsoil water. The catchment area above Meshed is nearly 4,000 sq km.

At present the development of subsoil water is limited to the kanats, the partial output from the Chashmeh-Gilas Spring, and the use of the water which emerges at intervals in the bed of the Kashaf Rud. The Gunabad and Chashmeh-Gilas sources are distributed by their respective jubes to beyond Meshed, and both these jubes could be improved to carry more than their present starting flow of about 700 liters per second (lps) each. The water demand is:

1. For Meshed city, for which a study is already being made, with a daily requirement of 25,000,000 liters.
2. For industry, such as the sugar factory and the power station and spinning mills.
3. For agriculture. For the latter, if new development could not deliver to the areas requiring water, through the two main jubes, it is probable that land adjacent to such new sources could be used, since, it is understood, the majority of the valley floor is suitable for cultivation.

The probable main movements of subsoil water in the northern half of the valley have been indicated on Exhibit D-15, which also shows the most suitable sites for wells.

The following projects are listed for possible consideration, starting at the upper end of the valley:

1. Aklamad Valley: This valley contains a 500-year-old dam, much silted, which allows a considerable subsoil flow beneath it. This flow could be tapped where it crosses the Meshed-Kuchan road and the area between the road and the swamp irrigated. The summer flow has been estimated at 300-400 lps.

2. Gunabad: The 11 kanats which feed this main jube draw their water from the re-entrant formed between the Kuh-i-Binalud and the Chil-i-Shah spur, but a very large quantity of water is not so collected and passes below the Meshed-Kuchan road near kilometer stone 185. This supply could be obtained by one or more wells at this point and either added to the kanat supply to the Gunabad jube or used locally for the proposed agricultural station, and for general irrigation. The estimated possible increment is 500 lps. No further development by kanat is recommended in this area.

3. Chashmeh-Gilas Spring: There are four main flows feeding this spring of which only two deliver the whole of their flows to the surface. The other two probably deliver to the valley subsoil much farther down. The whole of this water should be recovered at the spring by means of a lowered collecting pond and suitable borings to the two flows which give, at present, only partial delivery. The estimated possible additional output is 500 lps.

4. Area Between Gunabad and the Tus Road: There are only a few small flows from the southwest into the valley, and practically none from the northeast. This area, therefore, must be irrigated by channels fed from higher up, and, except in the central strip of valley near the Kashaf Rud bed, no great quantity of water can be expected from pumped wells.

5. Area Between Tus and a Line Through Milikabad-Mir Kariz—Sisabad: The valley here is more open and a line of wells, sited on the subsoil flows on the line Safiabad-Sayidabad-Amarghan, would increase considerably the irrigation to the southeast. Near Amarghan it should be possible to tap the flow entering the main valley from the Andaruk side valley.

6. On the Line Malikabad-Mir Kariz: A line of 12 wells approximately 2 km long has already been sited for the town supply and the first of these wells has been satisfactorily tested. There is a considerable gap at each end of this line before the next good well areas are met. It is considered that three or four good wells could be sited between the northeast well of this line and the Kashaf Rud, and that further wells could be sited on the left bank on the side valley flow which passes near Sartaush and Khargi. This last line of about 20 wells would make a considerable demand on the aquifers, of which there are three at this level of the valley, but the accretion from the Turughbeh, Andarukh and Sartaush valleys must be large and it is considered that a further line of wells from Torugh to Sharabad, with one, or a group, on the considerable subsoil flow near the Torugh Rud bed, would be satisfactory and would complete the possible extraction in the Meshed area.

7. Below the Line Torugh-Sharabad: The valley floor appears to narrow, but there is no reason to assume that similar treatment by lines or groups of wells at about 10 km interval should not enable a large proportion of the subsoil water in the valley to be usefully used.

None of the above proposed wells is likely to have any effect on the existing kanat systems since the sites selected are well below any wet sections of kanats, those being in almost every case near the edges of the valley floor, unless the valley as a whole is so over-pumped in a dry year that the general water table is lowered to a dangerous degree.

The principles applied in the above proposals could be repeated in many other open valleys in Iran, such as the Abadeh, Isfahan and Kerman valleys, and it is considered that an overall plan should in every case be prepared in order to obtain the maximum quantity of water with the least possible interference between wells, and the least possible reduction in the overall watertable level.

In cases such as that of the line of wells for Meshed at Mir Kariz, there is a power demand sufficiently concentrated to justify the installation of a central generating plant and electric motors to operate the pumps. Not only does this give a great economy in operating costs, particularly in labor, since the pumps do not, as is the case with diesel drive, require individual attention, but the depreciation on such plant is much less than with individual prime movers.

As a general rule, if power is obtainable from local town supplies or factories, electric drive should always be employed. Although the cost of electric power may be slightly higher than fuel costs for diesel drive, the savings on depreciation, maintenance and attendance will more than balance this discrepancy. By restricting pumping to "off peak" hours on the local station, it might be possible to obtain additional power and lower charges.

APPENDIX D-6

LIST OF WELL AND BURIED CUTOFF SITES BY OSTANS

(In the case of sites visited, wells have been classified by estimated pump capacity, that is, 6″ = 30 lps; 8″ = 50 lps; 10″ = 150 lps; and the estimated depth of well is also given.)

Ostan	Place	No. of Wells	Pump (in.)	Depth (m.)	Remarks
1—Resht	Sharifalbad	1	8	23	Agricultural pilot farm
	Kazvin	1	10	25	Town supply
	Tehran Road kilometer post 130	1	6	23	Agricultural pilot farm
	Arak	3			Trial wells where valleys open on to plain
	Siadohan-Zenjan Rd				Valley flows crossing road from north
2—Tehran	Veramin	2			Agricultural pilot farm
	Kazvin Road kilometer post 59	1	8	26	Agricultural pilot farm
	Tehran-Shahrud Rd	6			Side valley flows from Elborz Mountains
	Kashan	4		13	Near Fin spring, town supply and irrigation
	Natanz	2	8	18	River bed flows, town and irrigation
	Ghum	1	10	21	Town supply or irrigation. 2km southwest by road bridge over river
	Ghum Isfahan Rd	2	6		Side valleys into Anarbar River
	Karaj				Buried cutoff in gorge
	Kan				Buried cutoff in gorge
3 & 4—Tabriz	Marand Valley	3	10, 8 & 8	17	Side valley flows from south, Irrigation
	Khoy	1			River bed subsoil flow, town supply
	Khoy-Shahpur Rd	3	6		Villages north of Shahpur on Khoy Road

Ostan	Place	No. of Wells	Pump (in.)	Depth (m.)	Remarks
	Rezaiyeh	1	10	8	Town supply at headworks of jube
	Mahabad	1	6	23	Town supply near barracks to south of town
	Dizeh	1	6		
	Tabriz				Buried cutoff in Falkhed Rud bed above town
5—Hamadan	Hamadan	1	10	20	Subsoil flow from Morad Beg valley, town supply
	Kermanshah	2	10	12 & 18	Open well at Sarab, pumped well near old Shahabad Road
	Tang-i-Bostan	1	10	13	At road junction, irrigation
	Hamadan plain	2			Agricultural pilot farm
	Sehreh	1			Agricultural pilot farm
	Tang-i-Bostan Spring				Pumping plant to deliver to jubes at edge of valley floor
	Bisotun Spring				Pumping plant to deliver to jubes at edge of valley floor
6—Ahwaz	—	—	—	—	—
7—Shiraz	Bushire	2	10	80	Town, port and irrigation, possibly artesian
	Shiraz	8	8	56	Town supply
	Shiraz	2	6		Agricultural pilot farm south of town
	Firuzabad	1	6		Valley subsoil flow, north-west of valley plain
	Abadeh	12	8	32	Town and irrigation supply Valley project
	Abarzun	2			Town supply
	Abarzun	1	6	27	Umed Salar's garden site
	Marv-dasht Plain	1	6		Pulvar R. subsoil flow Agricultural pilot farm
	Abu Dasht	1			Demonstration farm
	Shahpur R.				Buried cutoff and diversion weir, Kazerun area
	Firuzabad				Buried cutoff in gorge above plain

Ostan	Place	No. of Wells	Pump (in.)	Depth (m.)	Remarks
8—Kerman	Kerman	6			Town supply
	Kerman	6			Irrigation
	Kerman	2			Agricultural pilot farm Northwest of Kerman
	Zabol	6	8 10		Trial wells on Zabol-Zahidan Road, irrigation supply
	Iranshahr	1	6		Town supply
	Bandar Abbass	2			Town and port supply
	Zahidan	2			Irrigation
9—Meshed	Meshed	12	10	45	Town supply
	Meshed	25			Valley irrigation scheme
	Sarakhs	6			Irrigation
	Khaf Valley	4			Irrigation
	Ghuchan	2			Irrigation
	Sabzavar	1			Agricultural pilot farm
	Gunabad (Jumain)	1			Agricultural pilot farm
10—Isfahan	Yezd	3	10	105	Town supply
	Ardokan	1	6	75	Town supply
	Aghda	1	6	40	Town supply
	Naiin	2	6	60	Town supply
	Isfahan	2			Agricultural pilot farm
	Taft (Yezd)	2			Agricultural pilot farm
	Murchen Khur	10			Irrigation
	Total	168			

The above list does not give all the possible well sites even at the places named. Where pump sizes and probable depths have been recorded, the site has been examined and either recorded or marked for use.

APPENDIX D-7

DRAFT SPECIFICATION FOR TUBE WELLS

This "Specification" does not attempt to include all the technical points which are desirable, but rather points out improvements on the present practice in Iran. Present practice may be said to be based on "the minimum installation at the lowest cost" and some of the difficulties in operation, already encountered, may be said to originate in this system.

1. The initial specification shall be for the drilling, lining and testing only, of each well, even when it might be assumed that wells close together will give the same output. Wells near together may either mutually interfere or may have greatly differing outputs.

2. Except where the driller considers that the bore can be drilled without casing, e.g. in soft rock, the normal well shall be drilled by the sinking of a 12 in. diameter slotted, flush-jointed casing, with driving shoe, and a most exact record kept of all changes in strata and the position of aquifers. A sample bore shall be kept, as well as charts. Additional samples of aquifer material, as free as possible from mixture with materials from adjacent strata, will be obtained. There is no objection to the sinking of wells by hand to water table to save time and drilling costs.

3. Where, from previous experience in that area, the approximate, or likely, depths of aquifers is known, the bore will be carried only into the impermeable stratum, below the lowest aquifer it is intended to use, a distance sufficient to ensure that this impermeable layer has actually been reached.

   In order to obtain maximum economy, the tender will be so priced that the actual depth drilled is that paid for, and, except where, as in new areas, there are no data on which a maximum depth can be assessed before drilling, the drilling will be by stages, each stage having a price per meter drilled and drilling being extended beyond an agreed limit by mutual agreement between the driller and the Central Water Authority.

4. On completion of the drilling, a string of tubing of socketed pipe, with strainer lengths to correspond with the known position of the aquifers, will be inserted in the driven casing, and the latter will be extracted.

   If possible small gravel will be inserted between the tubing and casing as the latter is being withdrawn to assist in forming a strainer around the fine screens in the tubing.

   These metal screens or strainers shall be of noncorrodible metal and the openings shall be such that all but the finest silt shall be stopped, and the total opening shall permit of a water speed through the strainer at normal estimated pumping rate of not more than 1 m per minute.

   It is advisable that the extra samples of aquifer material be used as a guide to design the openings in the strainers.

   When the drive casing has been withdrawn, the well lining shall be so hung from the surface that no load is placed on the strainers until such time as this lining can be fixed permanently in suspension by the concrete sealing slab.

5. On completion of the insertion of lining and strainers and the test of the output for a drawdown of not more than 4 m, the pump will be ordered. Where the depth to standing water permits, the pumping plant should be placed in a large brick-lined pit, as near to maximum water level as possible, and the pump should be of the horizontal spindle type and the prime mover should be direct connected. This should give a lower first cost for the plant, general economy, and ease in running and maintenance.

   Where the water table is too low for the above arrangement, a vertical spindle borehole pump must be used, driven by electric motor, or by skew gearing and shaft from a diesel engine, or by belt drive from a diesel engine.

   The present practice of using light multi-cylinder high-speed diesels (over 1,400 rpm) does give a lower first cost, but maintenance is more costly and more difficult than for single or twin-cylinder low-speed diesels. The latter, although their installation costs are greater, have a much longer life and can be maintained by less skilled men. The latter is a very important consideration in Iran.

METEOROLOGY

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METEOROLOGY

INTRODUCTION

Weather exerts a decisive influence on nearly all forms of human activities, but particularly in the fields of agriculture and aviation, where a sound knowledge of climatic variations is essential not only for long-term planning concerned with the development of natural resources, but for day-to-day operations.

It is for these reasons that most modern states have established national meteorological services. These national services are concerned with the collecting of meteorological data, not only from within the boundaries of the national territories, but also from adjacent states and from more remote areas.

In order to facilitate interchange of data, and to increase the reliability of records, it has become necessary to introduce uniformity into the methods of observation, collection, and classification of meteorological data. The two international organizations chiefly concerned with the standardization of meteorological operations are the International Civil Aviation Organization (ICAO) and the International Meteorological Organization (IMO). Iran is a member of both these organizations and delegates from this country have attended the conferences of both organizations which were held recently in Delhi.

The functions of a national meteorological service are to provide meteorological information and advice to government departments and to the general community on matters of value to the economic interests of the country; to agriculture, aviation, shipping, industry and water supply.

The service may be divided generally into two parts:

1. The provision of day-to-day information and forecasting.
2. The collection of climatological information.

The provision of day-to-day information includes the supply of current information, weather forecasts, weather warnings to the community at large and to particular interests. Distribution is made through the press, by radio broadcast or by notification to individual interests, and it is usually issued from a national center or, where appropriate, from regional centers. A daily bulletin containing meteorological observations made at stations during the previous 24 hours, weather charts and analyses of the meteorological conditions are usually published. The specialized requirements of aviation are met by providing meteorological advisory centers at the more important airfields, which should be linked by an efficient network of communications.

Climatological information includes information concerning the average, seasonal and extreme values of rainfall, snowfall, temperature, humidity, wind direction and velocity, and cloud intensity for various parts of the territory, leading to conclusions with regard to the relative suitability of different districts for particular economic activities.

In addition to the above main branches, the national service should normally also provide for participation in international co-operation through such bodies as ICAO and IMO, for carrying out meteorological research, and in some cases, as may be appropriate, for undertaking such geophysical studies as atmospheric electricity, seismology and terrestrial magnetism.

EXISTING SITUATION

Although Iran is a member of ICAO and IMO, there is as yet no central meteorological department in the country and the day-to-day forecasting service is at present undertaken by the Civil Aviation Department, while climatological data are received from stations in different parts of the country generally under the supervision of the Ministry of Agriculture.

Until recently the meteorological forecasting and day-to-day service for Civil Aviation purposes have been almost non-existent, except for partially-equipped stations at Tehran and Abadan. Steps have now been taken, following the appointment of a fully qualified senior meteorologist to reorganize the existing system, to draw up plans for future extension and to order modern equipment.

The ultimate requirements of the country will be determined by the number and grading of airports which it is desired to maintain for international and internal airline operations, and by the regulations prescribed by ICAO and IMO.

The existing airports amount to 42 in number, classified as follows:

	Number
First class	
Tehran, Abadan	2
Second class	
Tabriz, Resht, Babulsar, Meshed, Kermanshah, Isfahan, Shiraz, Kerman, Zahidan, Ahwaz	10
Third class	
Khoy, Rezaiyeh, Ardebil, Pahlevi, Ramsar, Bandar Shah, Bujnurd, Gurgan, Zenjan, Kazvin, Shahrud, Miamai, Sabzavar, Semnan, Razan, Hamadan, Khorram-abad, Arak, Ghum, Dilijan, Birjand, Bandar Shahpur, Aminabad, Yezd, Bushire, Kangan, Lingeh, Bandar Abbass, Jask, Chahbahar	30
Total	42

The present principal forecasting center is Tehran, with Abadan as a subsidiary forecasting center.

A start has also been made with the operation of synoptic stations at Tabriz, Kermanshah, Hamadan, Tehran, Meshed, Abadan, Isfahan, Shiraz and Zahidan, but staff and equipment are still insufficient.

The Civil Aviation Department has recently been voted a special sum of money from which Rls. 2,000,000 have been earmarked for meteorological equipment. Orders for this equipment have already been placed with British and American firms up to the amount allocated. This equipment is considered to be sufficient for operating some ten main synoptic stations.

The following extracts are quoted from the "First South-East Asia Regional Air Navigation Meeting of ICAO" held in Delhi, November-December 1948 (Aban-Azar 1327):

"Paragraph 3.3.5.1: In Iran, radiosonde stations at Meshed, Bandar Abbass, and Tehran would meet the needs of the South-East Asia Region."

"Paragraph 3.3.8: It is recommended that as far as practicable radiowind stations should also be provided at the same location as radiosonde stations."

"Paragraph 3.4.1: The Committee supports the view of IMO that vertical aircraft ascents should be used to supplement wherever practicable the existing network of radiosonde stations. Such aircraft ascents are of particular importance where the existing radiosonde network is sparse."

"Table 4: Iran: Recommended network of pilot balloon reporting stations making four ascents per day at 6 hourly intervals:

Index No.	Station.
40709	Tabriz.
40745	Meshed.
40754	Tehran.
40800	Isfahan.
40819	Kerman.
40823	Zahidan.
40853	Bushire.
40875	Bandar Abbass.

Improvements in the forecast and day-to-day meteorological service for civil aviation purposes are very dependent on efficient communications between the synoptic recording stations and the central forecasting office. Recommendations with regard to communications do not, however, come under this section of our report, but are given under the appropriate section dealing with communications.

For long-term planning in connection with the development of water resources, it is essential to have continuous climatological records stretching over many years from meteorological stations which have been well distributed topographically as well as geographically.

The location of precipitation stations in or just across the borders of Iran, from which fairly reliable data have been received in the past, are shown in Exhibit D-1 in the section on development of water resources in this volume. The records from these stations have been used in preparing the precipitation chart for the country, also shown in Exhibit D-1.

At most of these stations temperature records have also been observed, and in some cases relative humidity records are also available. A relatively small number of the rainfall stations situated in or very near Iran provide long-term records. The only stations from which continuous reliable records are available for periods extending over 20 years are Tehran, Meshed, Shiraz, Bushire, Jask, Lenkoran and Erivan.

At first sight it may appear from Exhibit D-1 that these stations are reasonably well distributed geographically. Unfortunately orographic effects play a great part in determining quantity and distribution of precipitation, and since the country is not relatively flat like Iraq, the geographical variation in precipitation is considerable. It is estimated that under present conditions Iran is covered by less than one station to every 33,000 sq km, which is not sufficient to give a true index of geographical distribution of rainfall. In Great Britain, for instance, a country with much less topographical variation and where precipitation throughout the year is much more uniform, the average area covered per measuring station is of the order of 48 sq km.

As regards topographical distribution of meteorological stations, it was noted that all the existing stations are located below an altitude of 2000 m, in the comfort of valleys, and in or near towns. As a result, there is no reliable information as to variation of precipitation with altitude. Some of the stations located on the lee-side of mountains, remote from the weather, may actually record misleading figures due to their being situated in rain shadows. A typical case where this is almost certain to occur is in the Kermanshah and Mamadan area.

One serious feature arising from this lack of precipitation stations at heights above 2000 m is that the lasting snowfall, which persists during the winter months, is not recorded at all. Up to the present time no serious surveys have been made to provide information as to the average incidence or the extent of this valuable asset.

How valuable a contribution is made to Iran's water resources by the snow storage of her mountains may be seen from Exhibit D-7 in the section on development of water resources, which shows the areas lying above 2,000 m altitude, amounting to some 280,000 sq km. From the rough estimates which are possible at this stage, we have deduced that the average annual precipitation over this area contributes about 30 per cent of the national total annual precipitation.

Up to the present, climatological observations have been made by various authorities and by private individuals. Recently the Ministry of Agriculture has taken over most of the observation stations.

RECOMMENDATIONS

Having investigated the position with regard to existing meteorological facilities and the future needs of aviation and agriculture, we have come to the conclusion that there is no alternative to the formation of a single National Meteorological Service.

In the first place Iran, as a member of the ICAO and the IMO, has obligations and commitments regarding meteorological information, and secondly, the proper and continuous development of her water resources, in accordance with an overall plan, requires consistent and efficient climatological observations, in accordance with standardized procedure.

Our recommendations, with a view to ensuring the efficient fulfilment of the functions of this National Meteorological Service, are as follows:

1. The creation of a central administration of the Service with two main branches: One branch to supply mainly the needs of civil aviation, and the other branch to be responsible for all climatological stations and data relating to agricultural needs.

2. The provision of efficient communications for the rapid collection at the central office of current reports from stations in the country; provision for the transmission of national meteorological messages, of reports, analyses, and forecasts as part of the system of international exchange; provision for the reception of collective reports from other areas and from abroad, and the co-ordination of elimatological observations made by individuals and authorities of the whole country.
3. Recruitment of adequate and suitably qualified staff and provision of reliable modern equipment for observation stations and the initiation of a training scheme to ensure expansion of the services in accordance with the long-term requirements of the nation.

IMPLEMENTATION

The headquarters of the National Meteorological Service should be located at Tehran, the seat of the government and the center of communications. At the head of this service should be a fully qualified director with administrative experience. The director will be responsible for organizing the Service and for recruiting and training the staff.

The functions of the Service are of such importance to the security and well-being of the nation that it is recommended that the Service be placed under the Ministry of Defense.

During the early stages the Service should consist of two main branches to cover the chief needs of the country. One branch, covering aviation, should be responsible for long-range forecasting, ordinary day-to-day synoptic observations and general climatological readings required for the efficient operation of international and internal airline systems. The other branch should be concerned with ordinary climatological data and statistics relating to agricultural needs. Each of these branches will require the services of a fully qualified meteorologist to act as advisor to the branch superintendent.

Provision should be made for a third branch to cover geophysical work and specialized research, to be established at a later date, as and when the country may need such a service. There is no pressing need for this branch to be established at the present time, and it would be difficult at present to staff it with Iranians.

We particularly recommend that a small but well equipped and efficient workshop be set up at the headquarters of the Service to deal with repairs of all instruments. At the present time the existing forecast and synoptic services of the Department of Civil Aviation are severely handicapped by delays which occur when apparatus breaks down. These delays arise from the fact that repairs have to be made, or replacements received from, abroad.

It will be necessary to arrange for effective liaison between the two main departments of the new Meteorological Service in order to correlate their efforts and observations with a view to issuing standard reports and publications. Liaison should also be established with the Central Statistical Bureau, and with the Central Water Authority.

An organization chart is given in Exhibit E-1 illustrating the manner in which it is intended that the Service should be operated.

We consider that there is available in Iran a considerable amount of information which has been collected over the years by various authorities and private individuals.

These observations will unfortunately not be continuous nor will all observations have the same standard of accuracy. It is therefore essential to commence by collecting at the central office all available information, and to analyze the data with a view to extracting and classifying, for future reference, all data which would be of use to the Service. Following are recommendations with respect to the operation of the Service.

FORECAST SERVICE

The main or central forecast collecting and distributing office should obviously be located at headquarters, in Tehran. Here should be concentrated the reception of current reports from internal stations and from external sources, the distribution of reports to other sections of the country and to other countries, and the issue of forecasts to the public. This should have technical supervision of other forecast centers and of the synoptic reporting stations.

To meet the needs of aviation in providing forecasts for individual flights, briefing for air crews and advice to air operating companies, it will be necessary to continue the subsidiary forecast station at Abadan. The forecasting centers at Tehran and Abadan should function continuously for 24 hours, with regular half-hourly reports, and equipment and staff should be selected accordingly.

Communications as such are covered in the section of our report devoted to that subject. It is nevertheless necessary to point out here that the efficient functioning of the National Meteorological Service is dependent on a highly efficient system of communications, and special requirements are briefly referred to here as follows:

Internal

Efficient communications between the synoptic recording stations and the central forecast office are essential.

From the communications section of our report (Vol. IV) it will be seen that the national telecommunication facilities proposed will, toward the end of the Seven Year Plan, provide direct wire line plus carrier telephone and telegraph facilities between all the synoptic stations and Tehran. These facilities will be suitable for the use of high-speed teleprinter operations. We also recommend the earlier establishment of short-wave radio links between synoptic centers and with Tehran. These radio links are also suitable for high-speed teleprinter operation and their use is recommended at the earliest possible date by arrangement with the operating agency.

It is further recommended that a high priority should be given to the establishment of teleprinter service between Tehran and Abadan. It is understood that the existing long distance plant between these points is suitable for this service.

External

At least three wireless receivers will be required at the central forecast office at Tehran for reception of wireless telephony broadcasts from other countries, and two sets at Abadan.

The central forecast office will initiate broadcasts in accordance with the international fixed-time schedule of collecting Iranian analyses and forecasts, and should receive, at half-hourly intervals, the broadcast reports from Abadan airfield. The actual wireless telephonic broadcast could be made from the Tehran broadcasting station, which would be provided in this case with a teleprinter line to the central forecast office.

SYNOPTIC REPORTING STATIONS

A network of reporting stations will be required to operate on a 24-hr. basis. It is recommended that the stations at Tabriz, Kermanshah, Hamadan, Tehran, Meshed, Kerman, Isfahan, Shiraz, Zahidan and Bushire should be equipped and staffed immediately to function as efficient synoptic reporting stations. Standard equipment should be provided at each of the synoptic stations. The following represents typical major requirements for an efficiently equipped synoptic station:

> Electric cup anemometer, barograph, mercurial barometer, hygrograph, nephoscope, raingauge, thermometer, thermograph, wind direction indicator, sunshine recorder, theodolite, balloon equipment and visibility meter.

At the Tehran and Abadan stations additional equipment will be desirable, as, for example, cloud searchlight, anemograph, and autographic rainguages.

Over the period of seven years the number of synoptic stations should be gradually increased to twenty. In addition it is recommended that radiosonde stations should be installed immediately at Tehran and Kerman and at Tabriz, Meshed, Zahidan and Bandar Abbas during the Seven Year Plan period.

We recommend that radiowind equipment should be installed at the radiosonde stations at Tehran, Meshed and Zahidan.

The location of synoptic and forecasting stations as recommended in our report is shown in Exhibit E-2. Under ideal conditions synoptic stations should report hourly, but we consider that it would not be practicable to implement such a program for some time to come owing to difficulties in staffing the stations with well trained personnel. Consequently we recommend that, to meet the increasing demands for forecasts throughout the 24 hours, the minimum requirements laid down by the ICAO Conference at Delhi last year should be followed and that observation should be made at 6-hourly intervals. This will ensure that a regular sequence of synoptic charts could be prepared. Reports from these stations should conform to the international synoptic hours of 00, 06, 12 and 18 GMT as soon as practicable.

CLIMATOLOGICAL SERVICE

The first requirement will be for the Meteorological Service to take over all existing climatological stations and re-equip them with reliable instruments wherever necessary.

The existing climatological stations are located mainly in administrative centers and consequently it should be possible to arrange for voluntary observers such as farmers, school teachers and others to take on the duties of observation and recording. In this manner the expenses to the Meteorological Service would be limited to the purchase and maintenance of instruments and to the minor expenses relating to correspondence and periodical inspection.

In addition to these existing stations, numbering about 50, it will be necessary to equip and operate new stations, the sites for which should be selected with a view to obtaining more information about variations of climate with altitude. Wherever possible such stations should be located above an altitude of 2000 m.

It will obviously be necessary to locate these new stations in outposts and at agricultural experiment stations, and consequently it will be necessary, in this case, to make

special arrangements for observations to be taken and expenditure will be necessary for staff.

We consider that it should be possible to staff, equip, and operate 50 such new stations, thus providing Iran with a total of 100 efficiently-run climatological stations at the end of the seven year period. It would be possible to equip a greater number of climatological stations, but in view of the fact that the Service would be in the formative stages during the early years it is not considered that a greater number could be operated efficiently and as a consequence the reliability of the data gathered might suffer. In our opinion it would be better to concentrate on a smaller number of highly efficient stations.

The equipment and observations required for climatological stations are not elaborate; they comprise rainfall, snowfall, cloud, wind, wet and dry bulb temperatures for humidity calculations, maximum and minimum temperatures, and in some cases evaporation and sunshine readings. Wherever possible readings should be taken twice daily, and the aim should certainly be to take readings not less than once daily. These stations should submit monthly reports to headquarters in Tehran, where bulletins and publications will be prepared.

More specialized observations such as, for example, soil temperatures and other readings could be undertaken in the field at the Government agricultural stations and elsewhere by special arrangement with the Meteorological Office.

It is particularly recommended that hydrological readings should remain under the Central Water Authority in view of the special nature of the observation and its importance to the development and utilization of water resources. The Water Authority should also be responsible for operating three or more snow survey stations in the Elborz and Zagros mountain ranges, the purpose being to obtain more information about the nature of the contribution to the water resources of the country made by snowfalls. The Water Authority should, however, collaborate with the Meteorological Service on this matter, and in any case it will be necessary for the Water Authority to provide full information about its readings and observations to the central office of the Meteorological Service.

PERSONNEL

We have previously referred to the duties of the director of the Service, and we have mentioned that it will be necessary to recruit two fully qualified meteorologists to assist the superintendents of each of the main branches of the Service. Under normal working conditions it will be necessary to have at least four observers at every synoptic station, but, for the period of the Plan, it will not be possible to bring the numbers for all stations up to strength immediately, and it will be necessary to expand slowly as and when trained observers become available. In some cases the synoptic stations may have to be operated on a part-time basis for some years. For forecasting purposes Tehran will require six observers plus three radio operators, and Abadan will require four observers plus three radio operators. It will be necessary to train at least two mechanics to take charge of the repair workshop at Tehran, such training to cover radio equipment.

The observers required for general climatological readings in the field will not need to be skilled operators. Where special observers are appointed to take charge of new stations located at outposts and away from towns and villages, preliminary instructions will be necessary in the use of instruments, observation technique, standard methods

of recording, and the proper reporting of extraordinary occurrences. Generally, in towns and villages, it should be possible to find volunteer observers.

As soon as the Service is inaugurated a training program should be launched. The aim should be to train scientific officers of degree standard so that they may take over special departments in the Service. The funds for such a training program, which should include a course abroad in meteorology, should not be taken from the sum allocated to meteorology in the Seven Year Plan Act, but should be provided from the Rls. 1,000,000,000 fund provided for "Grants to technical institutions for training of skilled workers . . ." (Fourth item, Chapter VI, of the Act).

BUDGET

In order to implement the foregoing proposals it is estimated that the rate of expenditures domestically and in foreign exchange will be as given in the following table:

	In Thousands of Rials		
Year	Domestic	Foreign Exchange	Total
1328—Second Half	1,750	1,360	3,110
1329.....	3,340	2,550	5,890
Remaining 5½ Years	23,240	4,490	27,730
Totals.....	28,330	8,400	36,730

The expenditure in foreign exchange should reach a peak at about the end of the third year, by which time the final plans should have been completed and the equipment ordered. From the middle of the fourth year onwards total expenditures should be at an almost constant rate, although there will probably be a tendency for a small increase every year due to increasing commitments.

We wish to emphasize that the budget as given above is insufficient, by itself, to cover the inauguration and operation of the scheme as proposed. Additional funds will be needed for the Service to be operated as a self-contained efficient unit. Extra funds, for training purposes, should be provided from the grants under the Plan to technical institutions for training of skilled workers, as mentioned previously. Accommodations should be provided by the Department of Civil Aviation and by the Ministry of Agriculture from their normal revenues.

Communication equipment should be provided from Plan funds allocated for the re-equipment of wireless, radio and telephone services (Chapter V of the Act). Once the scheme is inaugurated and operating it would be appropriate for the Ministry of Defense to make a small annual contribution to the budget of the National Meteorological Service from its funds.

SURVEYING AND MAPPING

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SURVEYING AND MAPPING

INTRODUCTION

Accurate surveying and mapping is fundamental to the orderly development of a country's resources. This fact is often ignored with results that can be most detrimental to the national economy, since it leads to haphazard planning, to serious delays in the carrying out of development plans, and to unnecessary expenditure on such matters as the determination of land ownership. The importance which should be attached to survey work as a preliminary to the preparation of any development plan, cannot be over-stressed.

The mapping of the country may be broadly divided into three sub-divisions:

1. Topographical and national surveys
2. Large and small scale surveys
3. Cadastral surveys

The ideal arrangement is for the first type of surveys to precede the second and third types and subsequently to be revised and brought up to date as the result of later surveys.

EXISTING SITUATION

Iran is faced with a large amount of survey work, and it is therefore important that it should be organized with the object of producing the maximum results in the shortest time and at the minimum cost. Careful organization and co-ordination, and a fully trained technical staff will keep to a minimum, compatible with the range of requirements, the variety of maps to be produced and published, and will provide a steady continuity of work ahead of development. The fullest use of air photography, which can be used for a variety of purposes, should be constantly borne in mind.

Any program of mapping must take account of the surveys already in existence. The following is a brief summary of the maps published by the Survey of India:

1. A 1:1,000,000 series covering the whole country.
2. A ¼-inch to the mile series covering the major part of the country.
3. A survey at 1:100,000, particularly of the southern part, with some sheets covering other parts of the country.
4. A survey at 1:250,000 covering considerable parts of the country.

Extensive areas in southwest Iran have been photographed for the Anglo-Iranian Oil Company, and some air cover exists for other parts of the country. Some of these areas have been mapped at various scales and photo-mosaics produced of most of the area photographed. These areas are shown in Exhibit F-1.

RECOMMENDATIONS

It is considered that, for purposes of the Seven Year Plan, the most urgent survey requirements will fall under the following heads:

1. Large scale maps for planning irrigation development and controlling agricultural expansion.
2. Large scale maps for planning the re-development of towns and cities; delineating municipal limits; planning water supply, drainage schemes and other public services; and for industrial development.
3. Small scale maps for investigating the water conservation, storage and power projects; and for forestry and natural resource development.
4. Small scale maps for civil aviation, geological exploration and general purposes.

The following conclusions and recommendations are numbered in accordance with the above:

First:

The scale recommended for large scale maps for irrigation is 1:10,000 with a contour interval of 5 meters or 10 meters depending on the character of the country. (See Exhibit F-2.) This will enable preliminary canal schemes to be set out and will help to confine the detailed surveys to smaller areas. It is estimated that for reasonably large areas the cost will be about Rls. 1,800 per square kilometer.

Second:

The scale recommended for town planning is 1:5,000, which is sufficiently large to show important buildings and houses. Such maps are already available for Tehran, Shiraz (partial), Meshed (being prepared), Ahwaz, Abadan and Isfahan (partial). (The Isfahan map was prepared for purposes of designing an electrical distribution system, and has, therefore, to be brought up to a specification suitable for water supply schemes, etc.) The remaining urgent priority areas are: Tabriz, Isfahan, Resht, Hamadan, Kermanshah, Ardebil, Rezaiyeh, Yezd, Kerman, Kazvin, Ghum, Shiraz and Arak.

In preparing these maps, air photographs of known scale could be used to provide the general detail, and the rest of the survey completed by theodolite and level.

The same methods should be employed for the smaller towns such as Bushire and Bandar Abbass, and in these instances it will probably be preferable to concentrate on ground survey methods mainly, but with assistance from air photographs where possible. The cost will vary from town to town, depending on airport and other facilities.

Third:

It is recommended that the scale for water conservation should be 1:50,000 with contour intervals of 25 meters. (See Exhibit F-2.) The cost of preparing these maps should be of the order of Rls. 1,000 per square kilometer, but this again is dependent on area, terrain and specifications, etc.

Fourth:

Maps for civil aviation have to be in accordance with specifications by the International Civil Aviation Organization (ICAO). The following extracts from the publication of this organization are given:

> "For aeronautical charts on scales larger than 1:1,000,000, designed primarily for visual flight, it is recommended the scales to be adopted should be 1:500,000 and 1:250,000. Local charts should comprise approach charts on the scale 1:250,000 supplemented by large scale airport plans of a suitable scale and size to ensure safety of operation under the most exacting forms of instrument approach and let-down procedures."

It is estimated that, for sufficiently large areas, and if the existing trigonometrical control could be utilized, the cost of air survey mapping to these specifications may be about Rls. 250 per square kilometer.

For general purpose maps three scales are recommended. The 1:2,000,000 scale is an excellent map for general study and as a wall map, and is particularly useful for showing the relationship with surrounding countries. The map should be based on the international modified polyconic projection. It should be maintained and revised as information becomes available from new survey work.

1:1,000,000 is an ideal scale for a general map used for showing administrative boundaries and for a variety of statistical purposes. We recommend that this may be part of the "International 1 million scale series". It should be checked, revised and published for the use of the Government and for private sale.

For civil aviation purposes, in accordance with the conditions prescribed by ICAO, and for general geological exploration a scale of 1:250,000 is recommended.

Cadastral Survey

This type of survey is of the greatest importance to the agricultural economy of the country. Without adequate cadastral surveys many improvements in farming methods and mechanized farming will be difficult to carry out, and the completion of certain development schemes, as, for instance, irrigation projects, will be seriously delayed.

Maps to a scale of 1:5,000 will be adequate except in the more developed areas where the plots are smaller, when a scale of 1:2,000 will be found necessary. We recommend that surveys of any new areas of land which are being opened up for development should be put in hand at once and that cadastral surveying throughout the whole country be checked and tied in with the main trigonometrical framework and with the main topographical map sheet line. In this connection the desirability of defining boundaries of properties with reference to a national grid should be considered. This will ensure that these boundaries can be recovered accurately by direct reference to the trigonometrical framework.

It is essential, in future cadastral work, to absorb the work already carried out by the existing Land Registration Department.

IMPLEMENTATION

The adequate surveying and mapping of the country represents a long-range program which will take many years to accomplish, and will extend far beyond the limits of the Seven Year Plan, but even for the purpose of achieving the objective of the Plan we consider that it will be necessary to set up a separate survey office, under the direction of a surveyor general, subdivided into four departments:

1. A trigonometrical and levelling department for basic control.
2. A topographical department for maps to a scale of 1:50,000 and smaller.
3. A large scale topographical department for surveys for development and town plans.
4. A cadastral survey department.

We further recommend that the survey office should operate as a branch of the Central Water Authority, as detailed in the section on the development of water resources in this volume report. The main reasons for this are that the majority of surveys will be connected with the development of water resources and that the Water Authority will be in a position to recruit and train the necessary technical staff, and to exercise technical supervision of the work. In this manner it will also be possible to reduce overhead costs.

The setting up of these departments will present difficulties in staffing owing to a lack of trained surveyors. As an immediate measure the Plan Organization should consider the short-term employment of foreign engineers, and at the same time start the training of Iranian engineers and surveyors.

The simplest solution, however, lies in the use of air survey maps, which have many advantages. The use of these maps will materially relieve the urgent problem of shortage of surveyors and planning staff, and leave the topographical departments concerned to deal first and foremost with the revision of maps. Nevertheless, it is still necessary to train without delay surveyors both for ground and air survey in order that they may be available as the program develops. It should be possible to arrange for assistance from the Iranian Army and Air Force.

It is now generally accepted that air surveying offers considerable advantages over the older methods of terrestrial topographical surveying. The necessity for basic trigonometric and height control is not, however, eliminated. Air survey enables a reliable topographical map to be produced in about one-tenth of the time required by the old methods.

Air survey photographs are of value for a number of purposes. They are being used more and more in all countries for agricultural development, in the study of crops and soils, for the study of erosion and soil conservation, for forestry and reforestation programs, for geological surveys and for archeological research.

The same photographs will give information on all these subjects and may be of value for more than one kind of survey. Thus photographs taken for a detailed topographical survey will, for example, supply material for a cadastral or geological survey.

Of most importance to Iran is the saving in technical staff. In the first instance the whole of the air survey work can be let out on contract. As technical staff becomes available, they can be used for ground control in connection with air surveys. Similarly,

when trained pilots and navigators are available, together with suitable aircraft, the actual flying can be undertaken by the Government. Eventually survey plotting might be undertaken by the Government, but this would be long-term policy and could be decided upon only after a careful study of costs and other relevant data.

In order to obtain the best results from air surveys and in order to reduce the cost, it is essential that a program be drawn up providing continuity of work, bearing in mind that the unit cost of air survey decreases with the area planned to be surveyed.

BUDGET

We give below an estimate of the cost of the air survey program which we recommend should be carried out as an essential part of the Seven Year Plan:

Scale	Description	In Thousands of Rials: Domestic	Foreign Exchange	Total
1:5,000	Survey for 13 towns for general planning and development of public utilities.....	3,200	4,900	8,100
1:10,000	A total area of 57,000 sq km as shown in Exhibit F-2 for irrigation development..	38,300	75,700	114,000
1:50,000	A total area of 111,000 sq km as shown in Exhibit F-2 for soil and water conservation, storage and power projects, forestry and natural resource development.....	38,100	72,900	111,000
1:250,000, 1:1,000,000 and 1:2,000,000	For civil aviation and geological exploration purposes	40,900	49,000	89,900
	Totals.....	120,500	202,500	323,000

It will be noted that we have not included any funds for cadastral surveying. These should be provided from ordinary revenues since the Seven Year Plan funds are sufficient only to launch the air survey program recommended.

The following table shows the proposed budget for carrying out this program. The peak of expenditure is reached at about the third year, whereas the essential mapping is scheduled to be completed during the fifth year.

Year	In Thousands of Rials: Domestic	Foreign Exchange	Total
1328—Second Half	8,690	19,800	28,490
1329	29,120	54,600	83,720
Remaining 5½ Years ..	82,690	128,100	210,790
TOTALS.....	120,500	202,500	323,000

Strictly speaking, it will not be possible for surveying operations to be reduced at the end of the fifth year, and in practice a new program would commence at about that time. It will, therefore, be necessary to allow for the organization expenses to continue at a constant rate after the third year in order to implement future programs, or such modifications of the present program as may be indicated as a result of experience gained during the first three years.

In preparing the above estimates such possible changes have been borne in mind, and it will be seen from Exhibit F-2 that a "later" priority area of some 15,000 square kilometers has been indicated for mapping to a scale of 1:10,000. Should tendered prices come out lower than anticipated, it is recommended that these areas should be surveyed and mapped under the Plan.

It is difficult, at this stage, to assess the total effective area to be surveyed for mapping to a scale of 1:250,000, since this will depend very much on the extent to which the information available from existing air surveys can be utilized for the production of future maps. Exhibit F-3 shows the areas which should be photographed for geological exploration purposes and mapped to the above scale.

It should be noted that the foregoing estimate represents the net cost of carrying out the program on the basis of employing foreign specialist firms, and does not include the head office costs of the survey department. These costs are included under the administration costs of the proposed Central Water Authority.

The total sum required for the execution of the survey program amounts to Rls. 323,000,000. The sum allocated in the fifth item, Chapter VI, of the Plan Act for topographical mapping and statistics combined amounts to only Rls. 300,000,000, of which Rls. 80,000,000 are required for statistics. It will, therefore, be necessary to draw on the funds of other appropriate sections to make up the required total. In order to make a fair allocation of funds we have taken into consideration the relative benefits to the various departments which will be derived from these surveys. We have set out below our recommendations regarding the contributions to be made by the interested departments in order to make up the total budget.

Description	Thousands of Rials
From central fund for topographical mapping...	220,000
From forestry	40,000
From civil aviation	23,000
From oil exploration	
TOTAL	323,000

TOWN IMPROVEMENT AND HOUSING

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TOWN IMPROVEMENT AND HOUSING

GENERAL INTRODUCTION

The total sum of money available for the planning and execution of works under the above heading, as allocated by the Seven Year Plan Act, amounts to Rls. 2,950,000,000.

In this report we have treated the subject matter under four major self-contained sections, each of which is closely related to, and dependent on, the others.

These subdivisions, together with the budget allocations, are:

	Rials
Town Improvements	500,000,000
Low Cost Housing	1,500,000,000
Potable Water Supplies	750,000,000
Modern Prisons	200,000,000

It must be appreciated that for a program of this scope and nature a great amount of organization and legislation, which must precede actual implementation of the programs, will be necessary. This aspect has, therefore, been treated fully in each of the sections of this report.

TOWN IMPROVEMENTS

INTRODUCTION

The Seven Year Plan includes a sum of Rls. 500,000,000 for miscellaneous public works and town improvements. The economy of Iran is based upon its agriculture, but the town is an essential part of the economic structure, and the efficiency with which it is organized will be reflected in commerce, trade, industry and agriculture. As the industrial capacity of the country increases, so will the towns grow in size and become correspondingly more important as a channel of capital investment.

The orderly planning of the town should normally precede many of the works envisaged in the Seven Year Plan, as for example, potable water supplies, housing, location of industry, electric power distribution and telephones. For Iran, at the present time, the problem is becoming increasingly important due to the drift of population from the rural to the urban areas. Unrestricted and unplanned development, with resulting high speculative land prices, will greatly increase the cost of government- and municipality-sponsored schemes.

The mere planning of the town, however, cannot solve the many problems involved, and legislation will be required to implement it. Furthermore, the town cannot function efficiently without certain public works and buildings. It is the purpose of this report to examine the works required and to analyze their importance in relation to the other projects being undertaken in the Seven Year Plan program.

APPRAISAL OF THE PRESENT SITUATION

General

The towns in Iran have evolved as a result of centuries of adjustment to climatic, social, and political influences. The last 50 years, however, have seen the sudden impact of modern ideas and culture, which in most cases have been entirely opposite to the pre-

vailing ways and customs of the country. The narrow winding kuchehs of Hamadan, for example, afford protection from the cold winter winds and shade from the summer sun, and were adequate for internal communications so long as animals were the principal means of transportation. They now, however, are proving restrictive for modern transport and costly for the installation of water supply and drainage.

In an effort to remedy a similar state of affairs a number of the larger municipalities have embarked upon road improvement schemes. Usually the new pattern for the roads is superimposed on the old town without due regard for existing site conditions, orientation, local experience or other considerations which should affect proper road planning. The cost, in most cases, has been high while the results achieved have not been entirely satisfactory or desirable.

Immediate Requirements

The problems affecting each municipality vary and will require individual study. We have made brief notes covering the larger towns which are contained in Appendix G-1. It has been possible, however, following upon our visits to a number of municipalities throughout the country, to form a general impression of the immediate requirements. Opinion in all towns was fairly uniform as to the works considered most important. In order of priority they are as follows:

1. Potable Water Supply. In no town is there a proper piped water supply and in very few towns is the available supply adequate or safe from infection. This subject is treated separately in a later chapter.

2. Electricity. In no town is the supply of power equal to the demand. In many cases local private enterprise is anxious to extend present facilities provided foreign exchange is made available. (See also the section on electric power (Vol. IV).

3. Road Construction and Surfacing of Roads and Footpaths. The construction of new roads is invariably designed to reduce the slum area of the town. Road surfacing is considered important, especially in view of the risk of disease spread by the dust from an unsurfaced road. This point was particularly stressed in Meshed.

4. Government and Municipal Buildings. These varied from Government and municipal offices to schools, hospitals, orphanages, food markets, hotels, etc.

5. Miscellaneous Items. These included such projects as sewerage, drainage, public parks and gardens, river improvement schemes, etc. It should be noted, however, that in Isfahan and Resht the installation of a proper sewage disposal scheme was considered of high importance.

Mapping and Statistical Data

There are no up-to-date and accurate maps of the towns, with the exception of Tehran, Isfahan and Shiraz, where maps have been prepared in connection with the water supply and electrical installation schemes, and of Ahwaz and Abadan where the Anglo-Iranian Oil Company has been responsible. Similarly, reliable statistics required for the proper study of towns are not available.

Population

The increase and drift in population have an important bearing upon the planning of the town. We have covered the question of population increase in the chapter on low cost housing and we have estimated that during the next seven years the population of the towns is likely to increase by 2,000,000. Apart from the question of numbers of inhabitants in a town, further detailed data are required. It is necessary to know the age structure of the town's population in order to assess future schooling requirements, and the number and average size of families to determine housing needs and areas of overcrowding.

Municipal Management

There are 168 municipalities in Iran, each responsible to the Minister of the Interior who is in turn answerable to the Majless. The affairs of the municipality are administered by a mayor and the municipal council.

In practice the whole of the local government of the municipalities becomes dependent upon Tehran. The budget, after approval by the municipal council, is prepared by the mayor for transmission to the Minister of the Interior for final approval. All construction schemes prepared by the municipal engineer must be approved by the Chief Engineer of Municipalities, who is not necessarily conversant with local conditions.

Continuity of administration is frequently lost due to the many changes of the key personnel appointed from Tehran. In addition, such personnel are often new to the locality, in which they have little interest other than the purely professional one of their job. Because of the large number of appointees of the central government it is difficult to obtain support from the local inhabitants for municipal schemes or undertakings and there is little interest shown in local affairs. Finally, since so many decisions have to be referred back to Tehran, and because communications are poor, the execution of a project becomes protracted and unduly costly both to the contractor and the municipality.

Municipal Budget

The municipal budgets are low and allow no margin for capital construction works. The following table shows an analysis of the municipal budgets for nine principal cities in Iran for the year 1327 (1948), the municipal budget for Tehran not being obtainable:

Analysis of Municipal Budgets

Town	Revenue Rials	Revenue per Capita Rials	Capital Works Expenditure Rials	Capital Works per Capita Rials
Tabriz	20,505,000	100	2,696,426	13
Meshed	30,979,265	155	18,178,112	91
Isfahan	25,919,832	130	2,660,747	13
Hamadan	4,782,000	46	617,062	6
Shiraz	32,128,086	268	15,567,009	130
Resht	25,465,489	182	5,792,096	41
Kermanshah	11,501,099	115	4,703,196	47
Kerman	3,369,000	67	410,800	8
Ahwaz	14,080,900	282	3,201,439	64

The revenue varies widely with each municipality as does the expenditure for capital works. We can find no satisfactory explanation of these differences.

The present system of municipal tax collection places the greatest relative burden on those in the lower income groups, since the major part of the revenue is derived from indirect taxation. Tax on real estate is negligible and in most cases is confined to leased premises, although at Meshed a rate is now levied on owner-occupiers' premises. In order to raise capital for particular projects it is common for the municipality to levy a special tax. At Meshed, for example, there is a tax levied on each passenger leaving the city, and at Shiraz all goods entering or leaving the town are taxed. In both cases the revenue raised is used for the asphalting of roads.

Legislation

The municipalities have little authority to carry out improvements of the town, and such legislation as exists is cumbersome and unwieldy. For road construction there is an act which allows the municipality to acquire land to the full width of the road only, upon payment of an agreed compensation. Acquisition must await a decree of the Council of Ministers and notices must be suitably advertised. Land on either side of the road cannot be acquired and, although there is a betterment clause enabling the municipality to take a part of the enriched value of a site, there is no evidence of this having been enforced.

Most municipalities have bylaws which stipulate standards of design, construction and other matters affecting new buildings. It is required that the builder of new premises should obtain prior permission from the municipality and receive a building permit. The penalties for infringements are so small, however, as to make the bylaws almost valueless and in practice many builders do not comply with them. In Tehran, for example, it is estimated that more than half of new buildings are constructed without a building permit.

Town planning legislation is contained in the municipal bylaws for streets and buildings. The principal provisions regulate heights of buildings on main khiabans, appearance of roofs and chimneys, and shop premises.

Land

The municipality can exercise very little control over the use of land within the municipal boundaries. Of recent years there has been considerable speculation in land which must react unfavorably upon the Government or the municipality when undertaking a project for which it is necessary to acquire land. We have dealt with land values in the chapter on the low cost housing program. Legal matters in relation to land are dealt with separately in the section on legal matters (Vol. V). Effective control over the use of land is in the interests of the community as a whole and must be exercised by them through the municipal council.

Location of Industry

The location of industry, either nationally or in relation to the town, has hitherto received little attention or thought. In some towns, as at Isfahan, factories have tended to group themselves in one area, but this is largely fortuitous and not the result of careful planning. During the next four years it is expected that there will be an increase in the industrial productivity of the country and new factories will spring up. To allow these to be located in a haphazard manner may prove uneconomic to the industrialist and harmful to the town. The long-term planning for industry must take into account its location, and within each municipality suitable sites must be found with good access for trans-

portation and space for expansion, and which are both within easy reach of an adequate labor supply and easily served with water and electricity when these services become available.

Road Communication

Road communications within the towns has received little study. The road pattern of the old town is not suited to modern traffic requirements and in most municipalities road improvement schemes have been carried out. Usually wide, straight roads are laid out, often on the grid iron form, with no consideration of traffic density and flow. This has created a large number of traffic intersections, most of them potentially dangerous, resulting in considerable traffic congestion. The wide road, without adequate shade protection from trees or buildings, is hot during the summer and cold during the winter. It also invites speeding and reckless driving and becomes a frequent source of accidents.

Vehicle parking spaces are not provided for in any of the towns; neither is there any effective parking legislation. The rapidly increasing number of motor vehicles is making parking a serious problem. At present, vehicles are parked in the roads, but this reduces the effective width of the roads and aggravates traffic congestion. The problem is not eased by the fact that most of the main roads contain the principal shops.

In a country such as Iran it is important to study the climatic conditions and to orientate the roads wherever possible according to prevailing winds and the sun.

Shops and Bazaars

The number of shops in relation to the population is very high in all towns. Few accurate statistics are available, but it is estimated that in Resht there is one shop for every 25 persons, while in Tehran about 25 per cent of the inhabitants obtain their living through the retailing of goods. In Kermanshah the shops and bazaars provide the principal employment to the people of the town.

Apart from the economic effect upon the country of such a high proportion of shops, it also causes serious limitations when planning the town. In nearly all cases the bazaar area is centrally placed and the land values very high. In Tehran, for example, the value of land in the bazaar area is equal to the value of the highest priced land in New York and London. As the bazaar area is often in the center of the area requiring redevelopment, this redevelopment may be delayed indefinitely owing to the high cost which must be paid in compensation.

Redevelopment Areas

In all towns there are large areas of overcrowded dwellings most of which are substandard. In the chapter on low cost housing we deal with the necessity for slum clearance and the re-housing of those in overcrowded buildings. In most towns some effort has been made to deal with these areas, but it has not been possible to do more than construct new streets through the quarter and, as we have shown, this does not provide a solution to the problem. The municipalities have no powers to implement a redevelopment program and such road work as is done can be carried out only at high cost.

Present Organization and Technical Knowledge

All public buildings are designed by the Construction Department of the Ministry of Finance, which is also responsible for putting the works into execution. The budget for the construction of public buildings is part of the Ministry of Finance budget, although many of the buildings are required for other ministries. The Ministry of Interior is responsible for the planning of the towns, the plans themselves being prepared by the municipal engineer and approved by the Chief Engineer of Municipalities. There is no evidence that any of these engineers have been trained in town planning or are sufficiently informed on the subject to be able to prepare comprehensive plans for their towns.

GENERAL CONCLUSIONS AND POLICIES

Provisional Planning Board's Proposals

We understand that it was intended to expend the funds voted to town improvements and public works on those projects put forward by the Ministry of the Interior in a Seven Year Plan for the municipalities. We have carefully considered this plan, but believe that it would be impracticable to base a program on the information available, principally because the expenditure envisaged is so greatly in excess of the amount allocated by the Majless under the Seven Year Plan. Furthermore, no system of priorities has been indicated which would enable us to assess the relative importance of the works proposed.

In our opinion the monies voted should be allocated in such a way as will best satisfy the broad principles laid down for the Seven Year Plan. It is recommended, therefore, that the funds should be devoted to those projects which meet the following requirements:

1. Will assist schemes recommended in other sections of the report, e.g., water supplies, electricity, location of industry, housing, etc.
2. Will promote efficiency in the organization and operation of the municipality.
3. Will contribute to raising the general standard of living of the people of the town.
4. Will tend to increase industrial efficiency.

The Need for a Town Plan

In our opinion one of the first requirements will be a detailed study of the town and the preparation of a draft town plan. From our studies of various cities in Iran it is evident that there is an urgent need for a co-ordinated plan. Such a plan should be positive in its conception and should not attempt to control development by restrictive measures or prohibitions. It should be drawn up as a guide to private enterprise to carry out development on sound lines. In all towns private enterprise is responsible for the major part of new development, and where the form of development has proved unsatisfactory it is usually due to lack of expert guidance from the right quarter.

The plan should pay particular regard to the utilization of land, including zoning for industry, houses, business quarters, bazaar areas, etc. Where new development or expansion is contemplated the advice of the Department of Agriculture should be obtained to ensure that the interests of agriculture are not subordinated to those of the town. It

is hoped that proper planning coupled with effective legislation will enable land values to be stabilized and prevent excessive speculation in land.

The preparation of the plan would include studies into the movement and increase of population, together with methods for controlling it. So far the only measure taken to control population movement has been the recently-passed decree limiting the size of Tehran. We consider that movement of population must be controlled by economic measures which will encourage it to settle in those areas best able to provide accommodation. Such measures would include the careful location of industry.

The plan must have due regard to the future installation of such services as potable water supplies, sewerage, electricity and telephones, and must show the order of priority in which the various areas of a town are to be extended or redeveloped in order that these services may be suitably designed. In such a way it will be possible to ensure that the installation of services conforms to long-term requirements, and so to avoid unnecessary cost of subsequent alterations.

Finally the plan must be based upon a careful study of the present traffic conditions and must allow for future traffic requirements. Roads must be designed to permit a smooth flow of traffic into and out of the city, avoiding, where possible, the purely residential areas. Shopping and bazáar areas should, where possible, be off the main traffic routes. Provision must be made for vehicle parking space, particularly to serve the administrative, business and shopping areas. In the study of traffic conditions due regard must be paid to the pedestrian, and footpaths and crossings arranged accordingly.

Preparation of Draft Town Plans

The amount of work involved in the preparation of carefully studied draft town plans is very large and it would be possible to deal with all the 168 municipalities only if a large staff of foreign advisors were brought in. We do not think that this is necessary and suggest that the draft plans be limited, during the period of the Seven Year Plan, to the major towns or to those towns for which a water supply scheme is being recommended.

Mapping

Before it is possible to initiate planning, accurate and up-to-date maps must be available. We have recommended separately, in the section on surveying and mapping in this volume, that air surveys should be carried out for several of the larger towns. For the smaller towns mapping must be carried out by ground survey. It is understood that the Ministry of the Interior has a small nucleus of surveying staff which, we suggest, should be utilized for this purpose.

Technical Assistance

Arrangements should be made for the Plan Organization to provide technical assistance and advice to the municipality. In the first years this will be primarily devoted to the preparation of the town plan, but it could be applied also to the design of sewerage and drainage systems for those areas where the water table is high. Similarly it could be utilized in the design and supervision of large municipal buildings for which local staff are not available.

Municipal Responsibility

Although it may be necessary to provide technical assistance to the municipalities for some years, we consider it important that they should ultimately become fully responsible for all works within the boundaries of their towns. Moreover, on account of the current limitations of their power, authority and organization to carry out the works envisaged in the Seven Year Plan, it may be necessary for the Plan Organization to act on their behalf. Good local government, fully supported by the people of the town, will be, we believe, the best means of ensuring the progressive improvement of the town.

Financial Assistance for Redevelopment

In most of the larger towns there must be some redevelopment of the old areas. It is hoped that in a number of cases this can precede the installation of a potable water supply. Such redevelopment will involve re-housing, which is dealt with in part in the low cost housing chapter. It will also involve the demolition of property, the construction of new roads, the provision of services and the erection of new buildings. As the municipality is the responsible authority for all this work and as the cost will frequently be beyond the slender resources of the municipal budget, some financial assistance must be provided from central funds.

Although the cost of redevelopment will be high it could be offset to a large degree if the betterment value accruing to the property as a result of the redevelopment were collected. Betterment, however, is always difficult to assess or collect, and it is suggested that the system of recoupment be adopted by the municipality when dealing with redevelopment areas. Under this system the municipality would be empowered to purchase all or any of the lands adjoining the land taken for improvement, with the object of securing for itself the benefit of any increase in the value of that adjoining land.

In some instances the increase in the value of the land after improvement may be sufficient, when realized, to pay the whole cost of the redevelopment scheme. This can be demonstrated in Tehran, for example, by comparing the value of land fronting Khiaban Rhey with the value of the slum area land immediately behind this frontage. The difference may be as much as five times. With such a difference in values, there is no reason why, given careful planning, the municipality should not recoup the cost of development.

The municipality will be hampered in making a start on redevelopment schemes, however, due to a shortage of capital. It is suggested that short-term loans should be made available to cover the first costs of the road improvements.

Loans for Civic Buildings

In many towns the municipality occupies leased premises, often at enhanced rentals. Many of these buildings are old and do not permit efficient organization. It is considered that the Plan Organization should be prepared to advance medium-term loans to municipalities for the erection of civic buildings where it can be shown that they will benefit the Seven Year Plan. It is envisaged that such buildings as food markets and municipal offices would be included under this heading.

Loans for Road Work

It is considered that the cost of asphalting the roads and footpaths in the town should be paid for from the municipal budget. It is obvious, however, that for a number of the municipalities it will be many years before such work can be financed from

their own budget. In most cases, however, it would be possible for them to meet the expenditure if it were spread over a number of years. The surfacing of roads and footpaths is a health measure besides being a natural convenience to all forms of traffic. It is, therefore, recommended that loans, repayable over a period of five to ten years, be made to the smaller municipalities for road surfacing works.

Training of Staff

Specially trained staff will be required for the preparation of town plans. Generally these will be of two distinct classes, those to be engaged on research and study of town planning problems and those engaged in interpreting the data provided in the preparation of the plan. There are no opportunities in Iran for training in either of these two fields and it will therefore be necessary to arrange for a limited number of selected personnel to be trained overseas. Until Iranians can be trained, foreign experts should be engaged.

Central Town Planning Organization

Because of the lack of technical staff skilled in town planning it will be advisable to employ foreign experts. In order that these can be kept to a minimum and the planning work be organized for the whole of the country, we consider that it will be necessary to form a central organization. This central organization will be responsible for the preparation of the draft plan for the municipality, but it will be the duty of the municipality to arrange for its execution and implementation. In time, as staff becomes available, it will be possible to hand over the planning functions to the municipality until ultimately the central organization will be the statistical and co-ordinating body only.

IMPLEMENTATION

In order that the program of town improvements and public works can be implemented it will be necessary to create new organizations and to introduce new legislation. Following are our recommendations:

Central Town Planning Bureau

We consider that it will be necessary to set up within the framework of the Plan Organization a separate organization which will be known as the Central Town Planning Bureau. It will be primarily the co-ordinating body for the whole of the country and will be responsible for the preparation of draft town plans for all municipalities. We visualize its responsibilities to be as follows:

1. To collate all available statistics and data pertaining to the town, and to carry out independent investigations and studies. These will include: history and antiquities, geology, land utilization, communications, population, house density, health and social problems, open spaces and recreation, education, public utility services, museums and civic buildings, transportation, and industrial location. It is expected that the Central Town Planning Bureau will collaborate, in these duties, with the various ministries, the Census and Civil Registration Department and the Central Housing Authority. For some of the original research required the municipality should be asked to assist, possibly with the aid of key personnel supplied by the Bureau.

2. In conjunction with the municipality to arrange for a survey of the town, where this is not to be carried out by air survey. It will also carry out a survey of all existing property.
3. To be responsible for drawing up a town planning code which, it is suggested, should receive the force of law. This will establish minimum standards, adjusted to suit the various localities of the country. It will aim at protecting the interests of property owners and the community as a whole, and make it necessary for all prospective builders to obtain approval of their projects before work is commenced.
4. To provide technical assistance to the municipalities in the preparation of town planning schemes. This will be extended to include any Government department or other authorized undertaking which is contemplating large-scale building development.
5. To arrange for the publication of information and advice on town planning.
6. To arrange for the preparation of data and information required by other departments in connection with projects recommended under the Seven Year Plan as, for example, housing schemes, water supplies or electricity distribution.

We suggest that the organization of the Central Town Planning Bureau should be as follows:

1. A Director-General, who should be a qualified architect or engineer. He should be assisted if necessary by a foreign expert, qualified in this field.
2. A Department of Research, which would cover such subjects as economics, geography, geology, population movements, the social sciences and technological progress. The department would be headed by a director with a degree in economics or geography and would include staff trained in sociology and statistics and capable of carrying out field studies.
3. A Department of Planning. It is suggested that in the first years the work of this department would be principally undertaken by foreign advisors. The department would be headed by a director who would be a trained architect.
4. A Public Relations Department. This department will arange for the publication of information on town planning.
5. A Legal Department. The legal implications of town planning are considerable and it is suggested that a separate legal department be organized to study and advise on legal matters affecting town planning.
6. A Survey Department. It is suggested that this department should recruit some of its staff from the Ministry of Interior survey department.

It is our opinion that the technical skill and experience of the country could be put to best advantage by employing independent architects and engineers for the preparation of the designs and supervision of construction of at least the larger public buildings and works. It follows that the Central Town Planning Bureau should have the requisite authority to call in outside consultants.

Municipal Reform

In order that the municipalities can effectively discharge the responsibilities which will devolve on them as a consequence of the implementation of the Seven Year Plan, it is necessary that they be given a greater degree of autonomy and that their organization be

extended. The Provisional Planning Board has prepared a memorandum on municipal reforms which we have carefully studied. We do not consider that it lies within our terms of reference to make detailed recommendations on this subject, nor has the time at our disposal been sufficient to deal with such a complex problem. We recommend, therefore, that a commission be appointed to study the whole question of municipal reform, including taxation and rates.

Non-Government Developments

It is not necessary or desirable that all development schemes should be sponsored and executed by the Government. We consider that in many instances private enterprise can carry out the development of the town without requiring any financial assistance, provided this development complies with the overall town plan. Similarly, development schemes may be contemplated by industrialists, pious foundations or the Industrial Bank. In all cases they should be fully encouraged and assisted. This may be best accomplished, on the one hand, by controlling the use and price of land or by compulsorily acquiring it at a fair figure and making it available to the developing organization, and on the other hand by providing main roads and suitable services. It is important that for all these private development schemes there should be the closest liaison between the promoter, the municipality and the Central Town Planning Bureau.

Legislation

Much of the legislation necessary to secure the implementation of the program envisaged in this part of our report is covered in the chapter on low cost housing. In addition it will be necessary to pass a town planning act. This act should give the Central Town Planning Bureau power to prepare a planning code to regulate such matters as widths of roads, traffic intersections, heights of structures, appearance of buildings, density and zoning. All land within the municipal boundary, and such land outside the boundary as may be determined for each town, should be defined as subject to planning control, and all intending developers should be required to obtain written approval for the proposed scheme before commencing construction. Failure to comply should be punishable by heavy fine and by the demolition of the offending structures if necessary. The act should authorize the Central Town Planning Bureau to prepare town planning schemes for the municipalities. These schemes, when completed and apprcved, would be binding on all developers, but could be altered or amended by the Bureau to suit changing conditions.

PROGRAM FOR TOWN IMPROVEMENTS

The overall program of essential works for town improvements and public buildings, prepared by the Ministry of the Interior under the Seven Year Plan, envisages a total expenditure of Rls. 3,623,065,600 plus a further sum of Rls. 1,407,947,600 for electricity and potable water supplies.

From our appraisal of the many problems involved it is evident that the next seven years can witness only the beginning of their solution. We consider that the sum allocated to town improvements under the Seven Year Plan, amounting to Rls. 500,000,000, is insufficient to cover the cost of such works that should be undertaken within the period. In our opinion, therefore, the major part of the finance for municipal work should come from local sources, either from the municipal budget or by means of a municipal loan. It is

our belief that, as the townspeople gain greater confidence in the municipality and local self-government, sufficient funds will be forthcoming in this manner. We are basing our program on the assumption that the municipalities will take an increasingly active part in the improvements to their towns.

Allocation of Available Funds and Financing the Program

We consider that funds should be allocated under the following broad headings:

1. Organization of the Central Town Planning Bureau.
2. Loans for redevelopment schemes.
3. Loans for civic buildings and public works.
4. Loans for road works.

Organization of the Central Town Planning Bureau

We believe that the first immediate need of all municipalities is technical assistance. In Tehran, for example, a piped water supply is being installed although a co-ordinated plan for the town has not been prepared. With proper guidance, all essential factors can be given consideration, and the limited capital available can be directed into the best possible channels. We have recommended a central planning organization as being the best means of utilizing the available technical skill, and have assumed that the money allocated to the Bureau would be a direct grant. No charge would be levied on any municipality for its services, but we have prepared our estimate on the basis that the municipalities would provide staff for the collection of data and statistics. This need not mean any considerable increase in their present organization.

We have allocated a sum of Rls. 115,000,000 for the Central Town Planning Bureau.

Loans for Redevelopment Schemes

Short-term loans will be made for approved redevelopment schemes. It is visualized that such loans would cover the first costs of road construction, including compensation. Loans, however, would be advanced only for those schemes which include the redevelopment of an area and where the municipality expects to recoup part of the cost from the consequent increase in land values. It is suggested that the loans should be redeemable over a period of five to ten years, and that the repayments should be set aside for further loans.

We have allocated the sum of Rls. 160,000,000 for loans for redevelopment.

Loans for Civic Buildings and Public Works

Applications for loans under this heading must be subjected to careful scrutiny, in order to ensure that the projects comply with the general policy adopted. It is suggested that the loans be confined to such projects as the erection of food markets and municipal offices, but in exceptional circumstances consideration could be given to a loan for a sewage disposal scheme. It is thought that loans would be advanced to those municipalities with a population of less than 100,000. Most of these municipalities possess no civic buildings, and the burden of providing the finance naturally falls more heavily on the towns with the smaller populations. Furthermore, most of the larger towns have sources of revenue not

available to the smaller communities. It is considered that the municipality should advance a sum equal to the amount borrowed before a loan is sanctioned. The loans would be repayable over a period of ten to fifteen years and the repayments used by the Central Town Planning Bureau for financing new loans. We have allocated the sum of Rls. 125,000,000 for loans for civic buildings and public works.

Loans for Road Works

Because so many of the smaller towns are built along either side of a main road, the costs of road construction, surfacing and maintenance are high in comparison with those for the larger towns. It is suggested, therefore, that loans for road works should be limited to the smaller municipalities, say those with a population of less than 50,000. The loans would be redeemable over a period of five to ten years, with preference for the shorter term loan. Repayments would be set aside for the financing of further loans.

We have allocated the sum of Rls. 100,000,000 for loans for road works.

The Program Year by Year

The program for the study and the planning of the towns can be adhered to, provided the required technical skill is made available. The execution and the implementation of the plan, however, together with the construction of civic buildings, are dependent upon the enactment of the various legislative measures which we have recommended. In preparing our program we have assumed that this legislation will be passed.

Year 1328

The last six months of this year must be devoted to organization and legislation. Apart from the need for study and planning, it would be impracticable to commence any construction projects in view of the limited time available. We recommend the following program:

1. The setting up of the Central Town Planning Bureau.
2. The commencement of studies and the preparation of draft town plans for the following municipalities:
   a. Tehran. Work has commenced on a potable water supply and it is important that the future growth of the capital city should be controlled and co-ordinated with the availability of water.
   b. Shiraz. Work has commenced on a potable water supply, but the supply to the bazaar area may have to be delayed pending a decision as to the future planning of the area.
   c. Isfahan. Work is now proceeding on an electricity distribution installation.
   d. Meshed. Investigations have been carried out and a scheme is being prepared for a potable water supply.
   e. Bandar Abbass. Preliminary investigations are being carried out for a potable water supply.

The total amount allocated for use during the remainder of the year is Rls. 7,500,000.

Year 1329

During this year all outstanding legislation should be enacted. A start cannot be made on redevelopment schemes until new houses have been built, but preliminary schemes should be prepared. The following is the recommended program:

1. Continuation of town planning studies already commenced.
2. Preparation of draft town plans for Tabriz, Bushire, Kerman, Kermanshah, Resht and Hamadan.
3. Commencement of studies for Yezd, Ghum and Ahwaz.
4. Preparation of schemes for redevelopment in Tehran, Shiraz and Isfahan.
5. Asphalting of roads in the smaller municipalities.

The total amount allocated for use during the year is Rls. 25,000,000.

Year 1330

During this year the organization of the Central Town Planning Bureau should be extended sufficiently for it to be able to commence studies of a number of the smaller towns. A start should be made on a number of redevelopment schemes in the larger municipalities, although this will be dependent upon the rate at which new houses have been built for those being displaced. The program recommended is as follows:

1. Continuation of town planning studies.
2. Redevelopment of the old quarters of Tehran, Isfahan, Shiraz, Kermanshah and Tabriz.
3. Asphalting of roads in the smaller municipalities.

The total amount allocated for use during the year is Rls. 55,000,000.

Years 1331 to 1335

During the remaining years of the Seven Year Plan there will be a continuation of studies of the towns. Redevelopment schemes will be undertaken, particularly in those towns where a potable water supply is being installed.

Estimated Expenditure

The budget allocations in Exhibit G-I show the total yearly expenditure, by main headings, and the proportion of foreign currency required.

LOW COST HOUSING

INTRODUCTION

The Provisional Planning Board, in its report to the Majless, emphasized the moral, social and political reasons which necessitated the participation by the Government in the provision of low cost housing. A sum of Rls. 1,500,000,000 was allocated for this purpose.

It is important to appreciate the economic reasons which have made it necessary for many countries to apportion a part of their budget to the housing of those in the lower income groups. Over the last decade the general standard of housing has improved, result-

ing in a natural increase in the cost of the house. At the same time there has been a rise in building costs, partly caused by building contractors having found more profitable building ventures than that of small-type houses and partly by a general increase in material costs. This general increase in costs, however, has not been equally matched by an increase in the wage levels, resulting in the creation of a large section of the population unable to pay for suitable housing accommodation. It is at this point that the state has had to intervene by subsidizing housing projects and by encouraging and assisting private enterprise in building houses for those of the lower income groups.

In most countries over the last 30 years it has been found that, because there has been no return on the capital invested, private enterprise has not provided low cost houses without assistance. If building costs can be reduced to coincide with the general wage level, or alternatively if the general wage level can be raised without increasing the building costs, then the amount of the participation by the state can be reduced until a point is reached where private enterprise can satisfy all housing needs.

Not only has bad housing a demoralizing effect on the adult but it has probably a much greater effect on the child, especially in Iran, where home life figures so largely in the shaping of the character of the child. Clearly, educational reforms can be of little value if slum conditions are allowed to prevail.

The effect on the health of the people of bad housing and over-crowding has been clearly established and reference is made to this in the section on public health (Vol. II). Social studies made in Glasgow and Birmingham in comparing the new housing schemes with the remainder of the city show that there has been a reduction in the infant mortality rate by one-half to one-third in the new housing schemes. The following table gives vital statistics for England and illustrates the great improvement to health in the newer residential areas:

Comparison of Vital Statistics of Garden Cities and Other Areas of England and Wales

	Mortality per 1000	Infant Mortality per 1000 born	Tuberculosis per 1000 living
Letchworth Garden City (built 1900)	8.0	33.6	0.38
Welwyn Garden City (built 1920)	5.9	25.0	0.574
Wythenshawe Estate (new suburb)	7.86	60.0	0.72
Manchester Slums	17.32	120.0	1.97
Manchester City	12.95	71.0	1.04
Average for England	12.00	62.0	0.84

In Iran the incidence of tuberculosis is particularly bad in such towns as Resht and Meshed, where there is evidence of serious over-crowding. The health authorities in various towns have stated how difficult it is to control diseases, especially such diseases as trachoma, when the living conditions are so crowded and the person treated can be quickly and easily re-infected.

Finally, there is the important political consideration of developing the nation's capacity to understand and appreciate citizenship. In all democracies home ownership is an accepted factor in the building up of good citizenship.

APPRAISAL OF PRESENT SITUATION

For the purpose of this report we have considered the housing problem in two separate divisions, housing for the urban communities and housing for the rural population. In most countries rural population is usually defined as people living in communities of less than 2,500, but for the purposes of this report we have enlarged this to include all townships up to approximately 10,000 population, since so many of these are primarily concerned with the rural way of life.

Rural Houses

It is estimated that there are approximately 2,500,000 families in the rural areas, the great majority of whom are living in single room houses. The effect of the village way of life on the health of the peasant is covered in the section on public health (Vol. II).

The ownership of village houses varies throughout the country. In many villages it is tied to the land, the peasant leasing the house with his land but not necessarily paying a cash rent. In other villages the peasant may be the owner of the house but not of the land upon which it stands. Only in a few cases does the peasant own his house and the land.

The design and construction of village houses differs according to locality, but the great majority are built of sun-dried bricks with mud floors and have little ventilation. Roofs may be of mud brick arches or domes, or flat roofs of poplar poles laid close together with matting and kahgil. There are no sanitary conveniences as such and cooking is done outside in the compound or, in the winter, in the one common living room. Generally maintenance of the houses is poor. Most villages have one important characteristic in common in that they are quickly erected and equally quickly deserted when water or crops fail.

There is no evidence of any thought given to the location or to the layout of the village itself, which remains essentially a collection of mud houses offering the barest of shelter to the peasant. Little serious attempt has been made on the part of landowners or the peasants themselves to improve upon the planning of the villages and houses. The Near East Foundation, however, has recently carried out useful work in this direction.

Urban Communities

The latest census of the population of towns over 10,000 inhabitants is given as 3,330,000, or approximately 650,000 families. There is a severe shortage of houses in most towns and overcrowding is a serious problem. The shortage of accommodations may be judged by the abnormally high rents prevailing in many towns. The Bank Melli Iran general cost of living index for 1327 (1948), the latest available information, is given as 989, while the rent index has risen to 1467, the base year 1315 (1936) being 100. This is illustrated in Exhibit G-2. In a later paragraph we compare the present rents with the cost of living, wages, and the cost of building materials.

Reasons for Housing Shortage

Over the last 10 years, the housing shortage has been steadily worsening, the following being some of the reasons which have contributed to the present situation:

1. During the war years house building was brought almost to a standstill.

2. Since the war high speculative prices for rent, coupled with high building costs, have tended to restrict house building except for those in the wealthier part of the population.
3. High speculative land prices have added to the cost of the building.
4. During the last 25 years there has been a steady drift of population into the towns. This is particularly noticeable in Tehran, where it is estimated that during the last seven years the population has nearly doubled.
5. A number of municipalities have carried out road improvement schemes involving the demolition of houses. In no instance has the municipality arranged for new houses to replace those destroyed.
6. Maintenance of houses is not good and some fall into disuse through lack of essential repairs. This is particularly noticeable in the Caspian area.

Apart from the general shortage of housing there is also, in each town, a high proportion of unsuitable houses. For example, in the southern area of Tehran, where approximately half the city's population is accommodated, most of the houses can be described only as slum buildings and will have to be demolished in the near future to make way for new houses. A similar condition exists in Shiraz, where approximately 70,000 out of a population of 123,000 are living in overcrowded dwellings.

Before the war the number of houseowners was comparatively high, but owing to the influx of population into the towns it is probable that a far greater proportion of the people are living now in rented accommodations.

Housing Requirements

In the time available it has clearly been impossible to assess the housing requirements for each individual ostan, and only a short summary has been made of the general problem of each of the principal towns. It will be necessary for the Plan Organization, in collaboration with the local authority, to make a careful and detailed study of each ostan with a view to co-ordinating the housing requirements.

Resht

The population of Resht is about 140,000. For a number of years there has been very little house building, probably because the cost of building is high as a result of having to import most of the materials into the town. The population has been increasing rapidly with the result that there is now a shortage of houses and serious overcrowding in many parts of the town. This may be gauged from the high rents prevailing—a small 3-room house in the worst part of the town being rented for Rls. 1,000 a month. In general the minimum rent for one room appears to be about Rls. 200 a month, but the average is probably higher and nearer Rls. 300 to Rls. 400 a month. Maintenance of the houses is poor and the municipality will be faced with a large rebuilding program.

Tehran

The population of Tehran is given as about 554,000, but recent estimates place it at nearer 800,000. It is certain that there has been, of recent years, a considerable influx of population into the town which is causing a shortage of houses for all classes. Rents in Tehran are the highest in Iran. There is, however, a considerable activity in house building for the middle and upper classes but so far, except for the Doshantepeh estate, there

has been no house building for those in the lower income groups. Overcrowding is acute, particularly in the southern area of the town where as many as 25 people are living in a house of five to six rooms.

Ghum

The population of Ghum is about 50,000. There is a general shortage of houses which may be due partly to the fact that Ghum is a pilgrimage center. In particular there is a shortage of suitable accommodation for Government civil servants. Rent for one room appears to be about Rls. 150 a month, but this is often higher when there is a large demand by the pilgrims.

Tabriz

The population of Tabriz is about 205,000. Due to the unsettled conditions in Azarbaijan there has been a tendency for people to move out of town and to Tehran. The number of houses in Tabriz is given as 45,000, which gives an average of nearly five persons per house. Rents for houses are comparatively low, averaging for a single room about Rls. 50 to Rls. 150 a month. Until more settled conditions return to this area it is probable that there is sufficient housing accommodation in Tabriz and the surrounding area. The general standard of house maintenance is high in comparison with the rest of Iran.

Kermanshah

The population of Kermanshah is about 100,000 and there has been a steady increase over the last year. Houses are scarce for all classes, but in particular for civil servants and those in the middle income groups. A large proportion of the existing houses are built with sun-dried bricks, of the single story type and with little or no sanitary conveniences. Most of these houses are occupied by the owner, who lets rooms to lodgers. Rents for one room range from Rls. 100 to Rls. 200 a month, and overcrowding is acute.

Hamadan

The population of Hamadan is about 105,000. Unemployment is high, and as a result of the present economic conditions workers have been moving into Tehran, but leaving their families behind. Few houses have been built in the town during the last ten years and there is now a general shortage of houses for all classes, particularly in the middle income groups. Hamadan is similar to Kermanshah in that it has a large area of slum-type dwellings. Rents for a single room vary from Rls. 100 to Rls. 200 a month.

Ahwaz

The present population of Ahwaz is about 50,000 but is likely to increase rapidly during the next seven years as a result of expansion by the Anglo-Iranian Oil Company. There is at present a shortage of accommodations for all classes.

Shiraz

The population of Shiraz is about 120,000 with indications of a steady increase in prospect and evidence of a general shortage of houses for all classes. Overcrowding is considerable, particularly in the southeast quarter of the town where in some houses of

four and five rooms 20 people are living. Rents in the poorer quarters are a minimum of Rls. 150 for a single room a month.

Kerman

Present indications are that the population of Kerman, now about 50,000, is declining. There is a need for redevelopment and re-housing, but it is probable that the existing number of houses is sufficient for present requirements. Rents are low, ranging from Rls. 60 to Rls. 120 for a room a month.

Meshed

The population of Meshed, now about 200,000, has been fluctuating, partly because it is a pilgrim center and partly because, during the last few years, a number of villagers have moved into the town owing to the failure of crops in their areas. Generally, there is an extreme shortage of housing and the accommodation available is poor. There is, in particular, a demand for small 3-room houses for the lower middle class income groups. Owing to the presence of pilgrims it is difficult to arrive at an accurate estimate of the rents being charged, but in general it would appear that the rent for a single room ranges from Rls. 150 to Rls. 200 a month.

Isfahan

The population of Isfahan, now about 200,000, appears to be increasing at a steady rate. Shortage of housing is greatest for those in the middle income groups, while accommodation for those in the lower income groups is bad and overcrowded. In the north and east of the town there is a large section of sub-standard houses, and most of this area will need to be redeveloped. Rents per month for a single room vary between Rls. 100 in the poorest area up to Rls. 400 in the modern quarter. Home ownership is widespread in Isfahan.

THE HOUSING PROBLEM

Assessment of Requirements

There is a lack of any reliable statistics or other data upon which a housing program could be formulated. In order that the housing problem can be appreciated we have endeavored to assess the requirements based on our field statistics and upon the information obtained from the various municipalities.

Rural Areas

It is considered that in the rural areas the problem must be dealt with as part of the general agricultural policy and therefore no attempt has been made to assess in detail the probable needs. We are of the opinion, however, that all housing in the rural areas will require attention, particularly in so far as sanitary requirements are concerned.

Urban Areas

In the urban areas new houses are required to relieve the present shortage, to replace dwellings that are a potential danger to health, and to cover, over the next seven years, any increase in the urban population. In arriving at an estimate of the probable

requirements we have been guided by the detailed studies prepared in connection with the Tehran and Shiraz water supply schemes and by data supplied by various municipal engineers.

It is estimated that at least 60 per cent of the population in the towns are living in slum buildings or in overcrowded dwellings. To relieve this shortage and to replace the slum dwellings will require at least 400,000 houses or dwelling units. This is based on the assumption of one family of five to each house. To this must be added the number of houses which will be needed to meet the increase of the urban population during the next seven years. In a later paragraph on population an estimate has been prepared of the probable increase in the population of those urban areas over 10,000 inhabitants, and on this basis it is estimated that a further 400,000 houses or dwelling units will be required. Thus a total of 800,000 houses will be required which, at present-day prices, would require an expenditure of not less than Rls. 80,000,000,000.

Type of House Required

It is necessary to consider the type of house which is in greatest demand. Any information available on this subject at the present time is bound to be biased since the accommodation demanded is regulated by the ability to pay the rent asked, which in turn is inflated because of the present house shortage.

An interesting feature of the housing economy in Iran is that there appears to be a higher percentage of house ownership among the lower classes than in the middle classes. The reason is probably that the houses in the poorer quarters have been handed down from father to son, while for the middle classes, being comparatively new and more mobile, the houses must be purchased from their salaries. Where there is a shifting population or where it is necessary to maintain a mobile labor force there must be houses for renting. On the other hand, however, home ownership usually entails an immobile labor supply but does promote good citizenship and helps to maintain an interest in local affairs and local government.

Housing Costs

The cost of house building is of importance in the preparation of a housing program. Since 1315 (1936), the base year for the Bank Melli Iran index, building costs have risen and from information available would appear to be higher in proportion than either the cost of labor or the cost of building materials. Reasons for the present high building costs may be summarized briefly as follows:

1. Increase in the price of land.
2. Building contractors have found more profitable ventures than small house building. The small amount of building work carried out during the war caused contractors to look for alternative work. With a return of peace-time economy there has now arisen a group of specialized contractors centered entirely in Tehran and who have had a number of large building contracts, including Government buildings, banks and blocks of high-class residential apartments. In general this type of building provides a greater profit than does small house building.
3. Shortage of skilled craftsmen.

4. Shortage of plant and equipment. There are very few contractors who own any quantity of builders' plant or builders' tools. Unless there is a steady continuity of work it is inevitable that the builder will not wish to invest capital in expensive plant. In addition, there are no equipment rental firms operating in Iran. There is also a definite shortage of such small hand tools as would help to increase the productivity of the workmen.

5. Increased use of imported materials. There has been a tendency over the last years to copy the construction methods of other countries in the design of buildings, and this has led to a greater use of imported materials.

   The difficulties of obtaining foreign exchange permits and the existence of the official and free markets have resulted in speculation in imported materials, especially those in high demand and short supply, such as steel beams, steel rods, etc., with the inevitable consequence of higher prices.

6. Cost of local materials. Throughout Iran there should be a plentiful supply of basic building materials, but from general observation it would appear that there is often a shortage, while the price of the materials available is often high for the quality produced. In some areas the small amount of building work has caused brick kilns to be closed or operated below the maximum capacity. The subject of building materials is also covered in the section on industry and mining (Vol. IV).

7. With the sole exception of Tehran, where there is considerable building activity, the amount of building work under construction in the various towns is negligible. The policy of successive governments has tended to centralize affairs in Tehran, and this has led to a greater building investment in the capital than elsewhere. Apart from this there has also been a considerable activity in the erection of Government buildings in Tehran, the yearly budget for Government buildings being greater in Tehran than for the whole of Iran. As a result the local builder has almost disappeared and has not the organization necessary to produce low-cost buildings.

A further factor to be considered in house building costs is the cost of labor in relation to materials. This is surprisingly low in Iran, averaging 20 to 30 per cent of the cost of the house and compares with an average of 60 per cent in the U.S.A. and 40 per cent in England. It results from the general low level of wages for the unskilled and semi-skilled labor, from the small amount of special finishes in the building and from high costs of materials. Any tendency to increase the wages paid to the unskilled worker would seriously affect the cost of building unless it were accompanied by an increase in productivity.

The Land Question

There has been considerable speculation in land in and around the principal towns and more particularly in Tehran, and to a lesser extent in Isfahan and Shiraz. The land is often purchased as a speculative rather than as a capital investment, the values being purely artificial and bearing no relation to the annual return that could reasonably be expected from the land. The existence of a speculative value in land makes it increasingly difficult for the Government to embark on any project, since the market value for the land will increase directly it is known that a scheme is in preparation. Some idea of the land values in the various towns is indicated by the following:

Approximate Values of Land in Various Towns

(Rials per square meter)

Town	Central business	Central residential	Outskirts of town
Tehran	3,000 to 15,000*	5,000	200 minimum
Tabriz	600	400	25 to 50
Meshed	600	200 to 500	50 to 200
Isfahan	500 to 600	300 to 400	55 to 150
Shiraz	1,000	500	100 to 150
Resht	300 to 500	100 to 150	20 to 40
Hamadan	100 to 150	100	5 to 20
Kermanshah	600	200 to 400	2 to 30

* Land values in the bazaar area are said to be Rls. 50,000 per square meter.

High land values will seriously limit the scope of the house building program, will curtail road improvement schemes and may prevent any redevelopment of the slum areas. Such legislation as exists authorizing the acquisition of land, either by the Government or by the municipality, is cumbersome and seldom used. It may be due partly to this deficiency in legislation that neither the Government nor the municipalities have acquired any considerable areas of land in or around the towns, in marked contrast to the municipalities in many of the Western European States. Conversely, in the case of Tehran, municipal lands have been sold to help finance the budget.

Rents, Wages and the Cost of Living

Rent is an important item in the cost of living. In the index prepared by the Bank Melli Iran, as well as in the "food basket" prepared by the Ministry of Labor for the minimum wage regulations, the proportion of income which the working man spends on rent is taken as 12 per cent. It is admitted that this is low.

There is no accurate information as to what proportion of income is now spent on rent, but from studies made in Tehran the following broad estimates have been prepared:

1. For the unskilled laborer earning Rls. 1,000 a month, rent takes an average minimum of 20 to 25 per cent. This rent would be for a single room in the poorest quarter of the town, and with only the minimum of kitchen and sanitary conveniences shared with several families.

2. For the semi-skilled and skilled craftsmen earning Rls. 2,400 to Rls. 5,000 a month, rent averages 20 to 30 per cent of the income. Accommodation is normally one or two rooms with electricity and with kitchen and sanitary conveniences shared.

3. For the lower grade of civil servants and office workers in the salary range Rls. 2,000 to Rls. 3,000 a month, rent averages 20 to 30 per cent of the income. This would be for a single room, but in a four, five or six room house where the kitchen and sanitary conveniences would be shared with the remaining tenants in the house.

4. For the middle grade of civil servants and office workers earning Rls. 3,000 to Rls. 5,000 a month, rent averages 25 to 35 per cent. Accommodation would be two or three rooms in a moderately well built house. Kitchen and sanitary conveniences may be shared with one or two families.

5. For the upper grade of office worker and civil servants with salary range up to Rls. 7,000 a month, rents may vary from 30 to 50 per cent of salary. This would be for a small self-contained flat or house or half a house, in which sanitary conveniences and kitchen would probably be self-contained.

A feature of the above studies is that the proportion of the salary paid in rent increases with the salary, which is contrary to the experiences in most countries as shown in Exhibit G-3. The reason may be found in the desire of the office worker to find accommodation of a reasonable standard even if this accommodation should consist of only one room.

Average rents in Tehran taken from a sample survey are as follows:

Accommodation	Rials a month
Single room—no conveniences poorest quarter of town	150 to 250
Single room—shared toilet, etc. middle class quarter	300 to 450
Two rooms—electricity shared toilet, etc. residential area	1,000
Three rooms—electricity shared toilet, etc. residential area	1,500
Three room self-contained apartment	2,000 to 3,000
Four to five room house or apartment	3,000 to 5,000

The following table shows comparable rents for various other towns in Iran:

Rents for Various Towns in Iran

(In Rials a Month)

Town	Single Room	Middle Class 3 or 4 Rooms	5-Room House
Tabriz	60 to 150	400 to 1,000	1,600
Meshed	100	1,000 to 1,200	1,500 to 2,000
Isfahan	100 to 400	1,000 to 3,000	4,000
Shiraz	150 to 350	2,000 to 4,000	6,000 and upwards
Resht	200 to 400	1,500	4,000 and upwards
Hamadan	150	1,000	2,000
Kermanshah	100 to 200	700 to 1,500	4,000 and upwards

Because rents are high, the amount of the workers' salary available for food and other necessities becomes correspondingly decreased. It has been estimated that the "workers' food basket" for Tehran is now some 50 per cent above the official minimum wage.

Where the house is to be sold on a repayment basis or is to be rented, the monthly payment made by the occupant must be related to the wages received and extensive studies on this subject have been carried out in a number of countries.

We have illustrated by means of Exhibit G-2 the increase in the rent index in comparison with the increase in the cost-of-living index. It is estimated that rents

generally have risen by more than 45 per cent over the cost of living and by more than 130 per cent over the cost of building materials. Much of this increase in rent is directly caused by the shortage of houses. This is well illustrated by comparing Tabriz, where there is no serious shortage of houses, with Tehran and Resht.

A further factor to be considered is the wage scale of those to be re-housed. There is a great difference between the income of the unskilled and skilled workman. Throughout the country generally, masons and carpenters receive three to five times the wages paid unskilled workers, while for such trades as electrician, fitter, plumber, etc., the difference is even greater. This difference is in sharp contrast to what is found in other countries. In England, for example, the unskilled laborer receives a wage rate of approximately 80 per cent of the skilled craftsmen.

Population

In order that a housing program can be formulated, and that the towns can be properly planned, it is necessary to study both the natural increase and the movement of the population. At present the statistics available are not sufficient to indicate population trends and it will be necessary at an early date to collect information as to the movement and the growth of the population in the towns.

Over the last decade there has been a steady drift of people from the rural areas to the urban centers. This is not confined to Iran but is occurring in many countries throughout the world. This increase in the urban population is invariably closely linked with industrial development. Exhibit G-4 has been prepared to show how the urban population in a number of European countries has increased while the rural population has remained fairly stationary or has declined, while Exhibit G-5 indicates the relative proportions of rural population to urban population.

The principal reasons for the present movement of population in Iran are as follows:

1. General lack of security as, for example, in Azarbaijan where the villagers are moving into Tabriz and the wealthy people are moving from Tabriz into Tehran.
2. Uncertainty as to future work and especially the decline in agricultural productivity.
3. The creation of public works which have drawn labor from the villages into the town. This has happened in such towns as Shahrud and Mianeh, where the railway construction caused an influx of a large number of constructional workers. Many of these have preferred to stay in the towns rather than return to the villages.
4. The creation of industry within the town as, for example, Tehran, Isfahan and Resht, where industries have been established and have attracted workers from outlying villages.
5. Generally education, and especially higher education, results in a desire on the part of those educated to live in the larger towns and to enjoy the amenities which they offer.

Apart from the above reasons there has been the over-all factor of centralized Government which has caused a large number of officials and merchants to gather in the towns, particularly in Tehran.

The probable trend of population cannot be estimated accurately on the data at present available. The latest figures show a natural increase of 18 per thousand. While not as great as other Middle East countries, this is regarded as high by those doctors who have been closely connected with the subject. It is probable that at the present time the natural increase in Iran is not more than four to six per thousand. The table below shows the birth and death rates and natural increases in neighboring countries.

Estimated Rates of Births and Deaths

Country	Total Population	Birth rate per 1,000	Death rate per 1,000	Natural increase per 1,000
Cyprus	393,000	30	13	17
Transjordan	1,029,000	48	20	28
Egypt	17,500,000	42	27	15
Turkey	17,800,000	42	20	22
Syria	2,901,000	42	20	22

We have compared Iran with neighboring countries and a graph, Exhibit G-6, has been prepared to show an estimate of the population increase over the period covered by the Seven Year Plan. In preparing this estimate we have assumed that the health measures recommended in this report will be put into effect and that the natural increase will rise to 18 per thousand, when it will compare with such countries as Syria and Turkey. We estimate that by the year 1335 the probable population of the urban areas may exceed 5,000,000 or a net increase of 60 per cent in the present urban population.

Labor

Unemployment among unskilled workers is high throughout the country. This is not a seasonable characteristic, although in many localities, such as Resht, the unemployment will be considerably reduced during the summer months. For all towns, however, there is a constant unemployment problem. It is the considered opinion of many municipal engineers that the unemployed unskilled labor could be usefully employed on house building. The problem is complicated by the short building season in many parts of the country which coincides with the farming season. In Hamadan and Tabriz, for example, the building season lasts only for about six months.

The majority of the unskilled labor in a town are casual workers, without the security of regular employment and wages. Such workers cannot be ideal tenants in a rented house or a good liability if the house is sold on mortgage.

In general the skilled craftsman is mobile and prepared to move to wherever the prospects of work and higher pay are best. Employment is regular and wages good. Although this class of the population would be a good proposition for houses which are to be sold on mortgage, it is likely that rented accommodation would be preferred.

ALTERNATIVE METHODS OF PROVIDING LOW COST HOUSES

The Mortgage Bank

The Mortgage Bank proposed using its own funds to build houses. These houses were to be sold on a long-term repayment system in a manner similar to the scheme worked out for the Doshantepeh Estate. There are certain advantages in this proposal,

in that the administration would be centralized in the one organization and that, by allowing the Mortgage Bank to build the houses which it finances, due regard would be paid to construction and to low maintenance costs. It would also be possible, because of the experience gained at Doshantepeh, for the Bank to make an early start on housing schemes.

There are, however, a number of fundamental objections to this proposal which, in our opinion, outweigh the advantages, as follows:

1. The scheme does not take into consideration the valuable contribution which private enterprise can make. In the United States and most European countries, private enterprise has provided the bulk of the houses.
2. Building costs in Iran have risen since the original Seven Year Plan was prepared, and it is doubtful whether it would be possible to build more than 20,000 houses with the money allocated. We consider that this would have no effect on reducing rents.
3. Where a housing scheme is carried out entirely by a Government body there will always be the problem of deciding which section of the population or which individual should be allocated the house. It will be argued by those opposing the plan that the needs of a small minority are being subsidized by the country as a whole.
4. It is unwise, in our opinon, to combine the functions of banking with that of building construction and estate management.
5. There is a danger that the Mortgage Bank might become rigid and an instrument of the state and would not have that flexibility which is essential in dealing with such a diverse problem as housing.

A Construction Bank

The Provisional Planning Board proposed the establishment of a special institution, the Construction Bank, which would be a financing organization only, and would loan money on a 50 per cent basis to any construction corporation prepared to advance the remainder of the capital. The corporation would be responsible for building the houses which it would lease or sell on a long-term repayment basis. It was suggested that additional capital should be raised by passing legislation compelling Government and private industries to invest money with the corporation. It was also suggested that a tax be levied on undeveloped land, the proceeds from which would be passed to the corporation.

This proposal has several advantages. The Construction Bank would confine itself entirely to financial matters. Private enterprise and local interests would be used to complement the program and houses would be available both for purchase and for renting. We consider, however, that the scheme has certain disadvantages:

1. In view of the long term of the investment we are doubtful whether any corporation could be formed unless it was assured of a high rate of profit. It was proposed, however, to limit the profits of these corporations.
2. We are doubtful of the wisdom or the practicability of any legislation compelling companies to invest capital in the construction corporations.
3. The tax on undeveloped land can be dangerous to good town planning. In towns such as Isfahan and Shiraz it might result in the loss of the gardens for which these towns are famous.
4. The construction corporations would be builders and financiers, and we do not consider this sound.

Housing Schemes Promoted Directly by the Government

Direct participation by the Government in the building of houses has not been considered by the Provisional Planning Board but has been suggested to us by interested persons as a possible solution. Experience in other countries has shown that Government housing schemes are invariably more costly than those carried out by the municipality or by private enterprise. If this proposal were adopted, we feel that there would be a tendency to concentrate the whole of the housing program in Tehran with dangerous consequences so far as the other ostans are concerned. This proposal suffers from the same difficulties as those enumerated above.

The Establishment of Co-operatives

It is part of the proposals of the Provisional Planning Board that co-operatives should be formed. Co-operative building societies have been extremely successful in Denmark, Holland and Sweden. In Denmark, for example, of all the houses built 30 per cent have been constructed by the co-operatives, while in Holland at least 75 per cent have been built in this way. The Swedish co-operatives have estimated that their buildings are approximately 30 to 40 per cent cheaper than those provided by private enterprise. The co-operatives have one important feature in common in that they require an initial share to be paid by the co-operator. The remainder of the capital required for building the house is obtained from the state bank or from the Government at a very low rate of interest, sometimes as low as 2 per cent, and repaid over a term of 40 to 50 years. In general, the co-operator does not own his dwelling, but in some of the societies in Sweden, known as owners societies, the member holds a share proportionate to the value of his dwelling.

There is no doubt in our minds that, one day, co-operative housing organizations could play an important part in providing inexpensive houses in Iran, but, in our opinion, the people are not yet ready for this type of organization, since they depend for their success upon a high degree of prosperity and security and a reasonably high standard of education on the part of the co-operators themselves.

Direct Grants to the Municipality

In most countries the municipalities have been adopted as the means of implementing the housing program and undoubtedly they will have to play a large part in carrying through the program in Iran. In our opinion, however, it will be some time before the municipalities are able to carry through a program of any magnitude because of their financial weakness and comparative lack of organization.

Direct Subsidies on [illegible]ch House Built

This was the common form adopted by most European countries immediately after the first world war. Under this scheme the Government made a cash grant to each builder on the completion of a house built to a certain specification and design. The cost to the state for these subsidies has been very great and out of proportion to the results achieved, so that after a short time most of the countries had to discontinue the subsidies. It would be, in our opinion, a dangerous method to use in Iran owing to the difficulty of adequate supervision over the various builders, and also because there would be no assurance that the real needs of the people were being met.

The Formation of Building Societies

The building societies of England and the building loan societies of America have had a phenomenal growth. Exhibit G-7 indicates the growth of the building societies in England immediately prior to the war. These societies rely for their capital to a large degree upon money deposited with them in the form of small savings accounts. Loans are advanced equivalent to 80 to 90 per cent of the cost of the house, repayable over 20 years and at interest rates of approximately 4½ per cent. Building societies in England were largely responsible for assisting private enterprise to build more than three times the number of houses built by the Government and the municipalities. The houses built were available to those in the lower and middle income groups. These building societies are, in general, covered by a separate act and operate on a fixed profit.

We feel confident that there is a future for the building society in Iran, although it may require a number of years before the public can be induced to place full confidence in it. In the first years, we consider that a single building loan society should be formed and that its capital should be guaranteed by money allocated from the Seven Year Plan. If, as a result of the success of this society, there should be a desire for the formation of other societies, they should be given every encouragement, although, in order to prevent abuse, it will be necessary to regulate and control their activities by legislation.

Legislation Compelling Factory Owners to Build Houses

A law has recently been passed by the Majless making it compulsory for all factory owners employing more than 100 workers to provide houses. It is clearly to the advantage of the employer that the worker should live under ideal conditions, but we consider, for the reasons set out below, that legislation in this direction is not necessarily wise:

1. Housing should be the responsibility of the community as a whole and not of a small group of employers.

2. The law sets a penalty on the larger industrialist and if enforced might reduce some industry to small units employing less than 100.

3. With the present capital structure of many industrial firms it would not be possible to tie up capital for a long period in housing which has little or no return.

4. Bad planning may result from factory owners building houses in the same grounds as their factories.

We consider, however, that encouragement should be given to the industrialist to help provide some housing for his employees and, if necessary, this should extend to the provision of financial and technical assistance.

RECOMMENDATION AS TO HOUSING POLICY

The foregoing appraisal emphasizes the diverse problems which are involved in preparing a housing program. For a considerable number of years there will be a housing shortage in Iran which the Government, acting on its own, cannot hope to remedy. Private enterprise, municipalities and charitable organizations must be encouraged to assist in this important work.

A Co-ordinated Housing Program

It is important that a housing program should be prepared for each ostan and be carefully co-ordinated for the whole country. This program should be widely publicized so as to give an opportunity for the financing of those industries capable of producing building materials and also to assure contractors and workers in the building industry of a continuity of work. This latter suggestion was carefully carried out during the housing drive in Great Britain in 1930 (1309) and had a marked effect in encouraging development of the skilled trades required and of reducing building costs.

Encouragement of Private Enterprise

Private enterprise has played a leading role in those democratic countries which have implemented a housing program. It may be necessary to exercise some control over the builders, particularly in matters affecting design and construction, but this would be no more than is already carried out in most states. Given the right incentive, private enterprise will produce more houses and at a much lower cost than could be done either by the Government or by the municipalities.

Home Ownership and Small Savings

We believe that opinion in Iran is unanimous that home ownership is an ideal to be aimed for. It has, however, some objections in that it tends to make labor immobile and does not help the civil servant who is liable to be moved from time to time. It will therefore be necessary to provide some rented accommodation. Generally, however, we believe that it will be found possible to build a larger proportion of houses for sale than for leasing or renting.

Together with the question of home ownership goes that of small savings. It is apparent that, even given the most favorable terms, there will be many workers unable to buy their own houses but who are in a position to set aside small savings toward accumulation of the initial payment.

Improved Sanitary Standards

One major decision of policy will have to be taken regarding the standard accommodation to be provided. There are two alternatives:

1. To build a greater number of houses of minimum or sub-minimum standard.
2. To build a lesser number of houses to a higher standard.

We consider it most important that from the outset certain minimum standards should be laid down and be strictly enforced. It may be advisable in the early stages to keep these standards to a minimum and to raise them as the house building program goes into full swing. At the same time if the house is to be constructed with durable materials it will be there for a decade or more, and it would be a mistaken policy to construct houses which will easily deteriorate into slums. This particular question will require detailed study and must be related to each ostan and locality.

At this stage we are unable to do more than indicate certain general principles which we feel should be incorporated. We are of the opinion that houses should be built

of durable materials, with impervious floors and with internal walls of a smooth surface and easily cleaned. The house should be of a minimum of two rooms with a separate kitchen, which should be entered either from the outside or from a separate corridor, and with separate toilet and sanitary conveniences to each unit. Our suggestions regarding the architectural design of the house are dealt with later.

It may also be necessary to give a clear-cut ruling regarding houses as opposed to flats or apartments. Where land costs are low there should be no question but that individual house units should be provided. On the other hand where land costs are high, and this will occur particularly in redevelopment areas, it will be necessary to erect buildings of two, three or four floors if the economic rent is to be kept within the limits imposed by the income scale. We do not consider there will be any serious difficulties in persuading people to live in apartments. In Tehran, for example, there are large numbers of the inhabitants who are at present sharing accommodations, either in a house or in a flat.

If flats are to be constructed, careful consideraton must be given to the design, particularly to access and to such facilities as will be shared. In general, we believe it advisable to provide separate kitchen and sanitary conveniences to each flat. It must be borne in mind that flats normally cost more for the accommodation provided than do houses. Each site must therefore be studied on its merits.

Decentralized Housing Responsibility

The ultimate responsibility for housing the people within the municipality should develop upon the municipality itself. Not only is it in a better position to judge requirements, but it has a greater interest in the improvement of the town. The municipal budget could not be expected to provide for the capital outlay necessary for a housing scheme, and some financial assistance will be necessary. At the present time the authority of the municipality has been largely centralized with the central Government in Tehran, and suggestions regarding this are made elsewhere in this section under town improvements.

Central Government Over-all Control

Despite their obligation to provide housing for the people within their boundary, it may happen that some municipalities are not sufficiently conscious of their civic responsibilities to prepare a housing scheme. Because of this some power must be vested with the central authority which will enable them to require the municipality to take action or, in the alternative, to prepare the necessary schemes themselves.

Financing of Schemes Not Self-Liquidating

It is recommended that full encouragement should be given to home ownership, but it is clear that there will be a considerable section of the working population which will be unable to afford to buy houses, even where the terms of repayment are particularly favorable. Because of this, and also because there will always be a demand for rented accommodation from semi-permanent residents, it is necessary to consider providing houses to be rented. Equally it will be found that, if houses are provided for renting, there will be a large section of the population which cannot pay a rent sufficient to cover

loan charges, and some form of subsidy may be required. This raises the whole question of rents in relation to the housing policy.

The inability of the worker to pay an "economic rent" is closely related to the general economic situation within the country. To what extent the gap between his ability to pay and the "economic rent" can be bridged by the housing program is a major issue.

In most countries there is a form of state subsidy designed to bring reasonable housing accommodations within the reach of the worker, but only in the case of a very few states has it been possible to include these in the lowest income groups. To some extent this problem has been left to solve itself, since the provision of new houses for those in the middle and upper income groups leaves existing houses available for those in the lower income groups.

A factor which will seriously affect the housing problem in Iran is the security of employment of the worker. The presence of a very large proportion of casual workers, or workers whose employment fluctuates with the seasons of the year, makes it extremely difficult to assess minimum rent standards. In fact, for most housing schemes, whether being rented or sold on a repayment basis, it may be essential to deal only with the workers whose employment is reasonably stable and secure.

Where subsidies are provided, they may be for one of two specific purposes, either to compensate for the inflated building costs, or to make up the difference where the general wage level is low. In formulating a policy for providing financial assistance it will be necessary to provide an answer to the following questions:

1. For what minimum income is it possible to provide housing and what will be the subsidy?
2. For what class of worker should accommodation be provided?
3. What is the maximum amount of subsidy to be allocated?

Before final answers can be given it will be necessary to carry out detailed studies over a period of several years. In fact, it is likely that considerable adjustments will have to be made during the course of the Seven Year Plan in the light of the experience gained. We set out below, however, certain basic considerations which we believe should dictate the policy for the first period.

Minimum Income Rate Needed for Housing

Three examples are worked out to determine income levels for which housing can be provided, based on rates prevailing in Tehran. We have, for the purposes of comparison, assumed two economic rents, the one being based on the repayment of a loan bearing interest at 4 per cent over a period of 20 years, and the other bearing interest at 4 per cent over a period of 40 years. The economic rent includes provision for maintenance, repairs and insurance.

Example 1

An unskilled laborer earns a monthly wage of Rls. 1,000. It is assumed that he will be in full employment throughout the year, and that he can afford to continue paying an average rent of Rls. 200 a month as at present in Tehran. This rental is twice the amount adopted in the Ministry of Labor wage regulations. We have assumed that

the minimum accommodation provided for this class of labor would be a 2-room house with separate kitchen and toilet conveniences. The economic rent, where the period of repayment is 20 years, would be Rls. 600 a month, and the economic rent, where the period of repayment is 40 years, would be Rls. 420 a month. There is thus a big gap between the ability to pay and the economic rent, even when the period of repayment is over 40 years.

Example 2

A semi-skilled laborer or lower grade of civil servant earns about Rls. 2,000 a month. The average minimum rent paid by this class of labor in Tehran at the present time is approximately Rls. 400 a month. If we assume a similar accommodation as used in example 1 above, it will be seen that, unless the period of repayment is extended over 40 years, a subsidy will be required.

Example 3

A skilled artisan or middle grade of civil servant earns approximately Rls. 3,000 to Rls. 4,000 a month, and pays at present an average of Rls. 700 a month in rent. For this example we have assumed a 3-room house of a somewhat cheaper design and construction than that erected at Doshantepeh. The economic rent, where the loan is repaid over 20 years, will amount to Rls. 800 a month and, where the loan is repaid over 40 years, it will be Rls. 570 a month. In this case a subsidy will be required only where the repayment of the loan is for 20 years or less.

The conclusion which may be drawn from the above examples is that it is possible to provide houses, and to lease them at rents which will produce a small return on capital invested, to those in income groups above Rls. 3,000 a month, provided that the loan is repayable over a period greater than 20 years. It will be practicable to subsidize rents to those income groups between Rls. 2,000 and Rls. 3,000 a month, again provided that any loan for the building of the house is at a low rate of interest and made available over a long period of years. It appears to us impracticable to consider subsidizing those in the income groups below Rls. 2,000 a month, since the amount of the subsidy would be beyond the funds available for the whole of the housing program in the Seven Year Plan.

Class of People to Be Housed

It follows from the above general conclusions that it will be necessary in the first instance to classify the type of people for whom housing can be provided, and that this must be on the basis of salary and continuity of work. Unless this is done for the first few years, we feel that there may arise a difficulty in collecting rents or loan repayments from those in occupation of the houses, with detrimental results to the housing program as a whole.

Maximum Amount of Subsidy

As we have pointed out, much more detailed study will be required of the maximum amount of subsidy to be allocated and, in particular, statistics will have to be assembled at regular intervals and compared with the Bank Melli cost-of-living index. For the purpose of the Seven Year Plan, we have assumed an over-all figure based on the allocation provided for housing as a whole. This figure will need adjustment year by year as the

housing program progresses. It will also be necessary to consider any subsidy which is granted in relation to the area in which the house itself is built. This will vary considerably and it may be necessary to adopt a uniform rate for each individual locality. Any subsidies to be provided under this general heading will be outright grants and will not be repayable as a loan.

Effect of Municipal Rates on Rents

Studies of the question of rent would not be complete without taking into account the effect of municipal rates. In some municipalities there is a tax levied on leased or rented property, and this tax is automatically reflected in the rent. If there is to be municipal reform, and this should include a tax on real estate, it can be expected that this tax, in the case of rented buildings, will be passed on to the tenant in the form of an increase in rent. In some countries it has been found that the state subsidy on low cost houses was less than the amount of tax included in the rent charged, or, in other words, that the state was subsidizing the municipal rates. It will be necessary for this question to be fully studied before rates are levied on rented property.

Financing of Slum Clearance

So far the policy formulated has been confined to the erection of new houses. It will be necessary, however, to deal with the problem of re-housing those in dwellings which are definitely a danger to health. This problem is as important as that of the erection of new houses to relieve the present shortage. In all towns there are large areas where the houses are overcrowded or of poor construction and without proper sanitary conveniences or any of the amenities now considered as essential. For the purposes of definition we are classing these as slum areas.

Such areas are a burden on the finances of the municipality. They produce no revenue other than that which is obtained by indirect taxation from the inhabitants as a whole. On the contrary, they require repeated allocations in the budget to deal with problems of health, crime, etc. Such areas in themselves are a danger spot for the whole of the town.

These areas are often centrally situated and if properly developed would make available valuable land for more profitable use. Such redevelopment, if properly handled, would be an asset to the town and, by an adjustment in the present taxation system, could be the means of providing increased revenue for the municipal budget. We have dealt with this subject at greater length in the preceding chapter on town improvements.

The municipalities have little capital and no authority to deal with slum clearance schemes, and the only work which is undertaken is that of road development through the areas. This in itself does not provide the answer, since the slum area still remains and, in fact, deteriorates, since it is usually boxed in by new buildings erected along the road frontages; also, such redevelopment invariably results in further overcrowding, as the population dispossessed by the construction of the road is not re-housed.

Although the buildings in these areas are, in themselves, overcrowded, it does not always follow that the density of the population in the area itself is too great, and where the locality is centrally situated it may be possible to erect 3-story or 4-story buildings which, without increasing the density of population in the area, would allow land to be set aside for gardens and other purposes.

Where municipalities have undertaken road improvement schemes, the engineers estimate that compensation to the owner of a house destroyed is approximately half of that required for the erection of a new house on the outskirts of the town. The only actual gainers by these redevelopment schemes are those fortunate land owners whose land abuts on the new roads, since land values may increase by as much as ten times their original value. If the municipalities were to redevelop whole slum areas, rather than just that part required for road construction, any increase in the value of the land would accrue to the municipality and all those dispossessed could be equally and fairly compensated. There are some cases as, for example, in Tehran, where such a scheme might be revenue producing.

It will be necessary to consider the question of compensation paid to owners of property in the slum areas. From our preliminary studies it would appear that some of the smaller slum houses are owned by the occupants, who supplement their income by renting the rooms to various families. Careful study could be made to see that when such an occupant is compensated he does not suffer undue hardship.

Before any such redevelopment scheme is put into operation, houses should be erected for those people who will be dispossessed. We believe that it should be possible for the municipality to erect new buildings with the aid of a Government loan for re-housing the occupants from slum areas, and to leave the areas to be developed as part of a town planning scheme. At present the principal difficulty, apart from the legal one of the acquisition of land, is that of the finance necessary to start the scheme, and we propose that the Seven Year Plan should assist in this respect.

We therefore recommend that the Government should make an outright grant for slum clearance schemes to the municipalities until such time as the municipalities can produce self-liquidating and revenue-producing schemes or can finance such schemes themselves. In order that this can be done, legislation will be necessary and it is dealt with later in this chapter.

Property Condemnation

It will be a necessary adjunct to raising the standard of living and the setting up of new housing standards for the state to have powers of condemnation. Such powers are available in all democratic states, where it is accepted that the state must bear responsibility for raising housing standards, but that at the same time landlords must share an equal responsibility for maintaining, in a reasonable sanitary state, any property leased.

Because of the large number of sub-standard houses the enforcement of such powers must be used with the greatest of discretion. These powers will be invaluable to the state or the municipality, however, when dealing with slum areas and particularly those areas which are a danger to the health of the neighborhood as a whole, and when wishing to prevent exploitation by unscrupulous landlords. It does appear that the present housing shortage is being used as an excuse for overcrowding and for excessive profit taking from that section of the community which is least able to afford it. From a study of certain buildings in the poor quarters, especially those which are seriously overcrowded, the rent appears to bear no relation either to the actual cost of the building or its present value.

In time it may be advisable to extend these powers to cover such contingencies as the spoilation of the land around the towns as, for example, at Resht, where the brick kiln pits are now full of stagnant water and a breeding-ground for mosquitoes.

The powers of condemnation of property should cover the questions of standards of accommodation, sizes of room, and structural requirements and should also include powers to prevent overcrowding. It must be emphasized, however, that such powers will be useless unless alternative accommodation is provided.

Ministry of Agriculture Responsibility

The rural housing program should be worked out and put into execution by the Ministry of Agriculture. Technical assistance, however, should be made available from the Central Housing Authority, which should also be responsible for incorporating in the plans of villages the recommendations of the health authorities.

It will be possible to make considerable improvements by the expenditure of relatively small sums of money, most of which will be used in providing building materials and supplies. The Central Housing Authority should be prepared to make grants or loans for the supply of basic materials for schemes approved by the Ministry of Agriculture.

METHODS OF IMPLEMENTATION

In order to carry out a housing policy and implement the program, it will be necessary to create new organizations and define the fields of responsibility as set out below.

Central Housing Authority

We consider that it will be necessary to set up within the Plan Organization a separate housing authority, legally empowered to carry out its prescribed functions; this authority to be known as the Central Housing Authority (Authority). It will be primarily the co-ordinating body for the whole of the country and will be responsible for the drafting of the housing program and for allocating the money available under the Seven Year Plan. We visualize its responsibilities to be as follows:

1. To collect statistics and data on the present housing situation. It should relate the statistics collected by the Census and Civil Registration Department on population and interpret these statistics for the purposes of assessing the housing requirements. In this it should operate in collaboration with the various municipalities, which would be primarily responsible for collecting and supplying the information required by the Authority.

2. In conjunction with the municipalities and the Central Town Planning Bureau it should carry out a survey of existing house property.

3. It should be responsible for drawing up a code setting out the minimum standards to be adopted in the design of houses. We suggest that this code should ultimately receive the force of law. Such standards would have to be adjusted to suit the various localities of the country, with particular reference to the climatic conditions and the availability of materials.

4. It should provide technical assistance for the design of houses and housing schemes when asked to do so by the municipalities or by an authorized undertaking.

5. The Authority should provide technical advice and assistance to the Department of Agriculture in connection with housing schemes for rural areas, and should make available the money required for the purchase of certain essential materials required to improve rural housing conditions.
6. The Authority should act as a co-ordinating agency for housing activities throughout the country.
7. It should be responsible for undertaking all housing schemes required by other Government departments.
8. It should be part of the Authority's responsibility to study building conditions in general, and with particular reference to labor and the question of the availability in the various localities of raw materials and builders' supplies such as windows, doors, sanitary fittings, etc.
9. Research should be carried out on the type of construction and the form of design best suited to the country. Experimental work on the use of raw materials and new forms of construction should be included. It is recommended that experimental houses should be erected in each ostan.

An information department should be formed within the Authority, responsible for publishing the activities of the Authority and for providing information on housing problems. It is recommended that close relations be entered into with factory owners, with a view to encouraging industrialists to provide housing facilities for their workers.

The Authority should be given powers to enable it to carry out housing schemes, that is, to prepare the detailed designs, to place contracts with the builder, to supervise the work during the course of construction and to issue payments to the contractors. It would have authority to carry out schemes on behalf of the municipalities. It is not planned that the Authority should develop into an organization for the actual construction of the houses, but it will be necessary, especially in the early years, to have an organization capable of executing housing schemes.

The Authority should assist building contractors in the purchasing and importation of plant. In deciding what plant should be imported, preference should be given to plant which will economize in the use of skilled labor as, for example, wood-working machinery. It may be advisable for the Authority to set up an equipment rental organization until such time as it can be taken over by private enterprise.

Personnel and Organization

The personnel required for the Authority must be young and enthusiastic. We have been impressed by the high standard among the architects and consider that there should be no difficulty in recruiting the required personnel in Iran, except that in the early stages foreign advice may be necessary for organizing the Authority and formulating the lines upon which it should work. In the first year and a half of the Seven Year Plan, the principal functions of the Authority will consist essentially of collection of data, the preparation of detailed studies and of organization. At the same time, however, it is essential that certain housing schemes should be put into effect and competent staff, including those capable of executing a housing project, should be available to the Authority.

We suggest that in the first instance the organization of the Authority should be as follows:

1. Director-General, who should be a qualified architect or engineer and be assisted by a foreign expert.
2. Department of research, study and program formation. This department would be headed by a director and be responsible for all detailed studies and research. The department should include on its staff personnel trained in sociology, economics and statistics.
3. Department of design, headed by a director who would be a trained architect. The department would be responsible for the preparation of typical house designs and housing schemes.
4. Department of construction, headed by a director who would be a qualified civil engineer or architect. The department would be responsible for the execution of housing schemes, for the placing of building contracts, and for supervision of works. The staff would include outside resident supervising engineers and qualified material estimators.
5. Branch offices should be opened in each ostan. Each office will be under the charge of a qualified engineer or architect and will include at least one assistant trained for research work.

It is recommended that the Authority should arrange for a limited number of selected personnel to travel abroad to gain experience in the carrying out of social studies and of housing problems generally. Arrangements should also be made for the training abroad of material estimators.

Building Loan Society

It is recommended that a special bank should be established with powers to lend money for house purchase. It is visualized that this bank would operate in a manner similar to the building societies in England, the building loan societies in America and the various insurance corporations. It is our recommendation that the present Mortgage Bank should take over this responsibility, since it has a nucleus of trained staff which can be used for the purpose.

It is recommended that the name of the bank should be altered, in order that its functions should be more clearly understood by the people, and for the purposes of this report we have referred to it as the Building Loan Society (Society).

It has been suggested that the Society should carry out the actual building operations, but we consider that this would not be wise. We appreciate that there are certain advantages to be gained but, in our opinion, they will be more than outweighed by the disadvantages. We believe that the Society will have a considerable expansion of business, which will require the full time attention of the board of Directors, and that any extraneous duties, such as those of building construction, estate management, etc., could only interfere with the financial and banking functions of the Society.

The Society will have authority to lend money up to a fixed percentage of the total cost of the house, the loan to be spread over a determined period of years at a low interest rate. When the revised charter for the Society is prepared, we consider that the amount of money which the Society can advance, the period of years or the rate of interest should not be defined or limited, except for guidance. We believe that this must be adjusted by the board of directors as a result of their experience in the operation of the Society.

The following table has been prepared to indicate the monthly payments which would have to be made for a loan of Rls. 100,000.

Period of years	Monthly Repayments in Rials at various percentage rates				
	7%	6%	5%	4½%	4%
10 years	1,186	1,132	1,079	1,053	1,027
15 years	915	858	803	776	750
20 years	787	727	669	641	613
25 years	715	652	591	562	533

We have drawn up this table, having in mind the average loan that might be made against a small 3-room house for a borrower earning approximately Rls. 3,000 a month and at present paying a rent of nearly Rls. 1,000 a month. It will be seen that, on this basis and with a loan repayment spread over 15 years, the individual concerned will be able to purchase his own house more cheaply than he can now rent inferior accommodation.

There will be an advantage in reducing the number of years over which the loan is made, but it is our opinion that it will be found advisable to keep the interest rate as low as is possible, and that a loan at 4½ per cent over a period of 15 years may be found to be workable.

The amount of money which the borrower should advance is difficult to fix. Opinions in the country vary considerably, but we believe that it is safe to say that the Society should be prepared to lend up to at least 80 per cent of the total cost of the house.

The Society must be given authority to borrow money and to issue bonds against assets. In particular we consider it important that facilities should be made available for the collection of small savings. At the present time the only channel of investment available for small savings is the Bank Melli Iran, which has been extremely successful in promoting its small savings group, as is illustrated by Exhibit G-8. Provided the Society is effectively publicized, we believe that it will be possible for it to make a considerable contribution to the economy of the country by the collection of small savings, especially when it is shown that such savings can be set aside against the purchase of a house while at the same time earning a nominal interest. We have been impressed by the desire on the part of many of the civil servants and those in junior grades to own their own houses. A small savings account would give them encouragement toward this ideal.

It is intended that money advanced by the Society should, where necessary, be paid to builders during the actual course of the construction of the building. The Society should use every means possible to encourage private builders to construct houses which could be purchased through the Society on a repayment basis. We are sure that private builders will be quick to appreciate the value of the Society and will be prepared to co-operate with it in the same way as builders have done in England and America.

As it is the stated intention of the Seven Year Plan to provide houses for those in the lower income groups, we suggest that the Society should lend money only for houses designed for these groups. Possibly the most effective way of doing this would be to limit loans to buildings below a certain maximum figure. This figure would vary according to the ostans, but provisionally we would suggest that for Tehran it should not be in excess of Rls. 160,000.

The Society should insert a clause in its agreement with a borrower regulating the resale or renting of any property against which money is advanced. Unless this is done we believe that there will be speculation in house property at the expense of the Society and the people.

The Society should make arrangements with the Iranian Insurance Company for the life insurance of borrowers to cover the amount on loan.

The Mortgage Bank has branches in nine towns, namely, Tehran, Tabriz, Sirjan, Kazvin, Hamadan, Kermanshah, Isfahan, Shiraz, Meshed. It is suggested that when the Society is formed new branches should be opened in Resht, Ahwaz, Kerman, Arak, Ghum and Sabzavar.

In our discussions with the Mortgage Bank we were given to understand that its present organization could be adapted to the requirements of a building loan society. This is an opinion with which we agree. It will be necessary for the Society to have a competent survey department. Any technical advice and assistance required for approving house designs can be available from the Central Housing Authority, but it will be necessary to consider the question of safeguarding the borrower and of inspecting the completed house. In the early years, it may be possible that this function could be carried out by the Central Housing Authority, but as the number of houses increases, it will be necessary to form a separate department capable of supervision of construction and of final inspection.

The Society should have authority to lend money directly to any co-operative organization which may be promoted. We do not believe that, for the first years, there will be any such society formed, but as security of employment becomes more general, there may arise a demand among those in the higher paid posts to form their own co-operatives for the purpose of building houses and, should this occasion arise, the Society should be empowered to give full assistance.

It is suggested that the present mortgage business of the Mortgage Bank should be reviewed in the light of the new proposals.

Decentralization of Housing Responsibilities

We have recommended that the housing policy should incorporate a program for the erection of low cost houses available for renting. The responsibility for the execution and the running of such schemes can be with the Government, the ostans or the municipality.

It is essential, in our opinion, that this responsibility should be decentralized, because of the administrative difficulties involved with centralization, the long distances in Iran and the wide variations in local and climatic conditions. Housing is essentially a local problem, and because the municipality is the accepted instrument of local government, the municipalities should assume the responsibility for housing within the boundaries of the town.

At the present time the municipalities do not have the authority, the capital, or the organization to enable them to discharge this responsibility and it will be necessary to pass an act of municipal reform, which is discussed later in this chapter. Technical assistance would always be available to the municipality from the Authority, and, during

the time when the municipality is building up its own organization, the Authority could be called upon to execute a housing scheme.

It will be obligatory for the municipalities to conform to the standards laid down by the Authority, but as it is visualized that these standards will have been arrived at in consultation with the municipalities, this should be automatic.

Where any scheme, proposed by a municipality, is to be financed under the Seven Year Plan, approval of the Authority must be obtained. It is not intended that this should be used as a check on the municipality but rather as a means of exchanging ideas and to see that the housing program throughout the country is properly co-ordinated. For this reason all other housing schemes within the municipal boundary should be brought to the attention of the Authority.

The municipalities should be given power to borrow money and to issue bonds. It is not expected that for the first years the municipality will be able to use these powers, as there exists on the part of the townspeople a general lack of confidence in the municipality. At the same time, however, there is a general desire by all concerned to see the town and its housing improved.

The municipality, in conjunction with the chamber of commerce, should also study within their area the general problem of the supply of building materials. In this they will receive expert guidance from the Authority, which must be responsible for co-ordinating the supply of building materials throughout the country.

The general recommendation regarding the municipalities and their functions as housing authorities is applicable only to the larger towns. Possibly one-third of the municipalities, covering one-half of the urban population, could be relied upon during the Seven Year Plan. It will probably be several years before the smaller towns can become sufficiently organized to carry out similar functions themselves. For the smaller municipalities an independent organization must be set up. It is suggested that this should be under the direct control of the Governor-General of the ostan and be assisted by the ostan branch office of the Authority.

Housing Schemes by Private Enterprise

In general, we are of the opinion that private enterprise should be responsible for the building of houses for sale, whether as a direct sale or on a repayment basis through the Building Loan Society, leaving the houses for renting to the state or the municipality. Private enterprise can be expected to provide houses for leasing at an economic level when the general rate of interest in the country has dropped.

When developing land around towns, municipalities must take steps to control the price of land, or alternatively to acquire it compulsorily and make it available to private enterprise.

Charitable, Religious and Welfare Organizations

In most western countries charitable organizations, religious foundations, welfare organizations and other philanthropic societies have been in the fore-front in providing low cost houses for those in the lower income groups. They have proved particularly valuable in the earliest days of a housing program, have been responsible for a considerable rise in the standard of accommodation and amenities provided, and have set a high

standard in the running and maintenance of housing estates. But perhaps their biggest contribution has been in the fact that housing schemes thus promoted have been rented to the workers in the lower income groups.

In Iran the people have not been benefited in this way, but the Seven Year Plan should be prepared to provide assistance to any organization wishing to undertake a housing scheme. It is suggested that this might be accomplished in the following ways:

1. By providing suitable land at low cost.
2. By providing, free of charge, any technical advice or assistance required.

In the preparation of a comprehensive housing program it will be necessary to undertake social studies in order that the requirements of the people may be fully met. Social and welfare organizations are particularly suited for this type of work because of their close contact with the people. It is suggested that the Imperial Welfare Organization be asked to co-operate in this way, with financial assistance provided by the Authority if necessary.

Government and Industrial Housing

The Majless has recently passed a law which makes it obligatory for industrialists employing more than 100 workers to provide housing accommodation. As stated earlier, we consider that this law will be difficult to operate. On the other hand, there are various advantages in industrialists' providing houses for their workers, and in view of the policy laid down by the Majless we believe that the Government-sponsored factories should have suitable accommodation for the employees.

The Industrial Bank has already provided some accommodation for the work people, particularly at the sugar beet factories, and it is understood that it is now anxious to provide housing for the permanent workers at all the factories. In our opinion this should be carried out. To date the Industrial Bank has not been charging rent for any of the accommodations provided for its employees, but the wages are adjusted accordingly. This can cause dissatisfaction among the workers, particularly when accommodation is limited, as it will be for some time, and it is our opinion that all housing accommodations provided for the Government-sponsored factories should be let at nominal rents adjusted to suit the normal income standards of the worker. It may, however, be advisable in the case of some existing factories to retain the present system for a few more years.

We recommend that a loan should be made to the Industrial Bank for the erection of houses for the workers, and that the rent should be adjusted to repay the interest, the cost of maintenance, management expenses and insurance on the property. It is understood that the Industrial Bank is willing to repay the loan out of profits from the factories, but for some of the more highly paid workers, those with wages of Rls. 3,000 a month or more, it should be possible to include in the rent some repayment of the loan. The loan would be secured against the houses and be amortized at a low rate of interest over a reasonable number of years, say 10 to 20 years.

If the Industrial Bank is able to show that there is a definite advantage in providing houses for workers, it is likely that other factories run by private enterprise may wish to follow their example, and in this case the same facilities made available to the Industrial Bank should be offered to the private industrialists.

Housing Design and Lay-out

One of the principal responsibilities of the Authority will be to study the question of the design of low cost houses and the lay-out of the housing estates.

Certain materials are in short supply, especially cement, steel and timber, and imported materials are expensive and involve foreign exchange. Within the country there could be available a good supply of those building materials, such as brick, lime, gypsum and building stone, which are required for house building.

It is important, therefore, that in each area the structural design should be related to the labor conditions and availability of materials. The design should also harmonize with local surroundings and this is usually best achieved by using local materials.

It will be necessary to complete research into the social problems obtaining in the various ostans before it is possible to lay down a definite code as to the standards of accommodation which should be provided. We have suggested that this might well be undertaken by the Imperial Welfare Organization. We consider that the houses should be designed to cater to the Iranian way of life and not be copies of house designs from other countries.

Houses should be orientated so as to take full advantage of prevailing winds and to make the maximum use of projecting cornices to give protection to the walls from the midday sun. We are of the opinion that the house should be of a minimum of two rooms with separate kitchen and outside sanitary conveniences.

Structural Design

In the first years the policy of the Authority should be to encourage the building of houses which will employ the greatest proportion of unskilled labor to skilled craftsmen. Extensive experiments have been carried out recently in England in this direction and new designs have been prepared which, without increasing the overall cost, have raised the amount of unskilled labor from 40 to 80 per cent of the total labor force. This is achieved by using some form of pre-fabricated construction.

Suspended floors and roof slabs are a major problem in house design. One system in wide use is that of steel beams and brick jack arches. This is not a cheap form of construction and involves a large amount of foreign exchange for the purchase of the steel. An alternative is the use of reinforced concrete floor slabs, but this is as costly and requires timber form work and cement, both expensive and in short supply. Another alternative, which we believe should be examined by the Authority, is the use of pre-cast beam units and floor slabs of light-weight concrete. This should show a saving, both in cement and steel, over the present system of construction and would reduce the amount of skilled labor required.

Wall construction should be designed to give the thermal insulation necessary for the particular area. On certain housing schemes, in the interests of economy, the wall thickness for smaller houses has been reduced to 22 cm. In our opinion this will prove to be a mistaken policy. We suggest that tests should be made of cavity wall construction which, while reducing the number of bricks required, may retain the same thermal insulation value as for a much thicker wall. There is no objection to the use of mud bricks, which have good insulation properties, provided that the walls are protected externally and internally and also from the damp rising from the ground. Research could be carried

out into the use of rammed mud walls. The use of gypsum hollow blocks for insulation lining should be considered, as these have been a success in some of the Middle East countries.

Doors, windows and joinery generally are a major problem owing to the very limited supply of good seasoned timber. It may be necessary for the Authority to give a clear directive regarding the use of unseasoned timber and to arrange at an early date for proper supplies of timber to be left to stand for seasoning.

The above comments are of a general character only and are designed to point out the need for further study into the problems of design. We would suggest that the Authority should undertake to build a number of experimental houses in each ostan with a view to improving upon local constructional methods and using, as far as possible, local materials and a maximum amount of unskilled labor.

Site and Lay-out

It is clearly impossible to lay down any definite ruling regarding layout of houses on any particular site. One of the principal considerations will always be the cost of the land. At the same time we do not favor the over-development of any one area and suggest that rules be formulated defining the maximum densities of population for various areas. We have noticed a tendency for laying out very wide khiabans or avenues. We believe that this is unnecessarily expensive, both in cost of land and in the cost of constructing the road and footpaths. Furthermore, a wide road does not give the same protection from the sun as a narrower, tree-lined avenue.

In general the layout of the buildings must be carefully studied, having due regard to prevailing winds, orientation, volume of traffic and density of population. Car and bus parking areas and garages must all be considered in relation to present and future requirements. The layout for these estates might with advantage be more informal. The roads need not necessarily be straight, but on the contrary could be designed where necessary to follow the contours of the land. Thought should be given to architectural treatment, the houses being considered in relation to the street itself and not as individual units.

Provision should be made for open spaces, the planting of trees wherever possible, and for such communal amenities as a mosque, shops, schools, clinics and cafes. This is especially important where the estate is placed any distance from the town center. If possible new estates should be planned on the basis of being largely self-contained.

Maintenance and Management

Our observations following field studies lead us to believe that maintenance and management have not been given sufficient consideration. Many of the buildings throughout the country, with the possible exception of those in Tehran, are poorly maintained. This may be due to shortage of money, to the effects of the war or to a lack of knowledge or appreciation of the importance of good maintenance. It should be an accepted policy that for all schemes run by the Authority or the municipalities an organization must be set up to ensure the proper maintenance of the housing estate and of all the houses. It is suggested also that the Society should insert a clause in its agreement requiring that houses for which it has advanced money should receive proper maintenance. Where this is not done the Society should be authorized to arrange for it to be done at the occupant's expense.

Panel of Architects and Engineers

The Central Housing Authority will be primarily an organizing body and should not be expected to undertake the design of the housing schemes. The Authority should have the power to appoint independent Iranian engineers and architects to act as consultants in the preparation and supervision of housing schemes. To assist in the appointment of these consultants a panel should be prepared for each ostan of those qualified architects and engineers capable of acting for the Authority.

LEGISLATION

In order that the housing program can be properly implemented it will be necessary for new legislation to be passed and for at least part of such to be put into immediate effect. The principal enactments required are discussed in the following paragraphs.

Central Housing Authority

This act will authorize the setting up of the Central Housing Authority and will give it power to sell or lease property. Power to acquire property will be delegated by the Council of Ministers, but the terms for compensation will be set out in this act, together with such safeguards as are deemed necessary where property is to be leased to private undertakings. There should be authority to prepare housing codes which, after consideration by the Majless, should ultimately receive the force of law. The Authority should be given powers to execute housing schemes, including powers of arranging contracts with builders and of certifying payments in respect to the work. It should also include powers to manage, or alternatively to form organizations to manage, housing estates.

The Authority should have power to require the ostans or the municipalities to prepare schemes where no housing has been undertaken. Where the municipality does not take such action the Authority should have the power to act as though the municipality had called upon them to carry out the scheme. The act should include a section giving the Authority general powers to act for all other Government departments or Government-sponsored bodies in respect to housing schemes. It is suggested that the overhead costs of such services should be charged to the department concerned at a fixed percentage.

The Authority should be authorized to employ outside assistance, either foreign experts or Iranian engineers and architects capable of carrying out housing projects.

Building Loan Society

This legislation will be a revision of the charter of the Mortgage Bank changing its name to Building Loan Society. It will grant authority to the Society to make loans for house purchase, whether the house is newly built or under construction, and to make payments to the builder during the course of construction. A maximum cost shall be stipulated for the value of the house against which loans can be made, but there should be a proviso that this ceiling figure could be adjusted upon the recommendation of the board of directors to the Plan Organization, should it appear advisable or if the funds of the Bank are such as to enable them to extend their activities to cover more expensive houses.

The Society should be given authority to borrow money and power to issue bonds. It would have authority to open small savings accounts upon which a nominal interest would be paid, and to give special consideration in making loans to those who have a small savings account with the Society. The legislation will set out the new capital of the Society as advanced by the Seven Year Plan, but there will be no limit set to the amount of money which the Society can borrow. It will be necessary to codify the present regulations affecting mortgages and, if necessary, to split this activity of the Society from its functions as a building loan society.

Power of Condemnation

This act will give to the municipalities and to the Authority the following powers:

1. Power to condemn a house as unfit for human habitation, having regard to ventilation, size of room, sanitary facilities, etc.
2. Power to condemn a building as being structurally dangerous.
3. Power to prevent overcrowding by establishing certain minimum standards as to the number of persons to be accommodated in any one room of a given cubic content.

The enforcing authority should have the right to require the owner to pull down property, or alternatively to repair, alter or otherwise carry out works in order that the property should conform to the minimum requirements published by the Authority.

Slum Clearance

This act will grant the municipalities power to designate an area as a redevelopment area, and should include authority to compensate owners for land acquired under powers to be delegated by the Council of Ministers, terms of payment to be set out in the legislation. The municipality would have power to develop the area and to sell or lease any part of the land within the area. It would include a provision enabling the municipality to borrow money from the Seven Year Plan at a stipulated rate of interest, repayment to be spread over a reasonable period of years.

Rent Control Act Revision

The present Rent Control Act should be amended to give it a much wider application throughout the country and a more realistic relation to present property valuation and to scales of rent. Before the revised legislation is introduced, it is suggested that a commission should be appointed to study the working of the Rent Control Act and to make recommendations as to its amendment.

Local Government Housing

The act would include the granting of powers to local governments to borrow money or to issue bonds, the land required for the housing scheme to be acquired by powers delegated by the Council of Ministers. It should set out conditions under which the schemes are to be managed and the standards of rent to be levied.

House Design and Construction

The act would make it compulsory for all persons intending to erect a house within the municipal boundary to obtain approval of the design. They would be obliged to see that the house built was in compliance with the code of practice laid down by the Authority. Failure to comply with the provisions of the act would render the builder liable to a heavy fine or alternatively, at the discretion of the Authority, would make it necessary for him to pull down the offending structure.

Acquisition of Land and Property

This subject is dealt with in the section on legal matters (Vol. V) and invests in the Council of Ministers power to delegate such authority as needed.

SEVEN YEAR PLAN HOUSING PROGRAM

The housing program must be flexible and capable of yearly adjustment. The provisional program and the allocation of the Seven Year Plan funds, which we put forward, is intended as a guide and will need revision as statistics and data become available.

We have estimated that, if the total funds available were used by the Government or Government-sponsored body entirely for the building of houses, they would be sufficient only for about 20,000 houses. This assumes that labor rates and the cost of materials remain constant, which is by no means certain. The housing shortage is such as to require more drastic remedies than can be obtained by the building of this limited number of houses.

A yearly target cannot easily be estimated for the first years, since the participation of private enterprise is difficult to foresee. We believe, however, that there are sound political grounds for preparing and publishing an estimated figure. In the later years of the Seven Year Plan a more accurate target can be fixed.

In the first years private enterprise probably will be concerned principally with the provision of houses for sale which will be purchased by means of loans from the Building Loan Society. When investment in buildings becomes more general it is likely that private enterprise will provide an increasing number of houses and apartments for rent.

Program Financing and Allocation of Funds

It is recommended that the Seven Year Plan funds should be controlled through the Central Housing Authority and be allocated under the following broad sub-divisions:

1. The Central Housing Authority organization.
2. Loans to the Building Loan Society.
3. Grants to the municipalities for slum clearance schemes.
4. Subsidies for housing schemes not self-liquidating.
5. Loans to the Industrial Bank and factory owners.
6. Sundry loans.

The Central Housing Authority

The expenses of the Authority will be relatively high during the first years in comparison with the total expenditure on housing. The setting up of the Authority will be the first step in the formation of the housing program and upon the speed with which it is formed and upon its ability to carry out, in the shortest time, the duties allotted to it, will depend the success of the Seven Year Plan housing program.

Because of the lack of any statistics or data or of any studies of housing in Iran, it will be necessary for the organization to be fully staffed at its inception. It must also be prepared to undertake housing schemes on its own initiative. As the housing program develops, some of the duties and functions of the Authority will be delegated to the municipalities. To what degree the organization can be reduced at a later stage will be dependent upon the ability of the municipalities to discharge their responsibilities. On the other hand, if, through the assistance of private capital and private enterprise, the housing program develops faster than is visualized, then it may be advisable to maintain the organization of the Authority at its full strength.

We have allocated the sum of Rls. 35,000,000 for the organization of the Authority, as follows:

1328	Rls. 5,000,000
1329	15,000,000
1330	10,000,000
1331	5,000,000

We have assumed that the interest on the loans made through the Authority would supplement the budget in the first years, and from 1331 should entirely provide the revenue for the budget. We estimate that an interest rate of 2½ per cent on loans advanced by the Authority should be sufficient to provide its full budget.

The Building Loan Society

We envisage that the capital of the Society would be made up by loans from the Seven Year Plan, by private capital including small savings, and by investments from Government organizations. We have recommended a total loan to the Society of Rls. 700,000,000 which would be made available during the first half of the Seven Year Plan. This would enable the Society to make an immediate contribution to the housing program and help to inspire confidence in investors. For the second half of the Seven Year Plan the Society would be financed by private and public investment and by amortizations on loans.

Funds for loans to the Society are allocated as follows:

1329	Rls. 100,000,000
1330	200,000,000
1331	300,000,000
1332	100,000,000

These loans, however, should be made available to the Society at regular intervals according to its requirements for capital. The interest rate should be kept as low as possible to enable the Society to make a maximum contribution toward financing low-cost

houses. We have estimated, for example, that an interest rate of 2½ per cent would be sufficient to cover the administration charges of the Central Housing Authority. We have made no recommendations regarding the term of the loan as we consider this must be adjusted in the light of the experience gained by the Society and upon its ability to borrow money from outside sources. For the first seven years no part of the loan would be repayable.

Additional capital for the Society will be available from the small savings accounts. It is impossible to predict how much money may be deposited with the Society in this form. Much will depend upon the way in which the Society is publicized and its achievements in financing low-cost houses. If the Bank Melli small savings accounts can be used as a guide, it could be conservatively estimated that the amount which the Society could expect from this source might be equal to the Government loan.

There are additional sources of capital which might, with advantage, be invested with the Society. One of these is the Ministry of Labor aid fund which has reserves accumulated in most localities. For example, the reserve fund at Abadan is said to be Rls. 6,000,000. It has been agreed that these funds should be used for the welfare of the workers. At Isfahan a limited housing scheme has been commenced, financed from aid funds. Excellent though this scheme is, it is open to a number of administrative difficulties as, for example, the question of ownership, responsibility for management and maintenance, and difficulty of allocating so few houses among the large number of workers who have contributed to the fund. If the aid funds are invested with the Society, many of these difficulties can be overcome, while at the same time earning interest. By arrangement with the Society, priority and special concessions could be granted to those workers who wish to purchase a house and who have contributed toward the aid fund.

The Iranian Insurance Company would expect an increase in business as a result of life insurance against house purchases. It is suggested that consideration might be given to the investing of some of its reserves with the Society.

The administration costs for the Society will be reflected in the interest rates charged on the loans made for house purchase. In Great Britain the management costs average about 0.8 per cent of the mean mortgage assets. This can be achieved only with the large volume of business handled; we believe, however, that in Iran it should be possible to keep the administration costs down to 2 per cent. The administration costs will include the opening of new branch offices as previously recommended.

Taking a conservative view of the expansion of the Society, we estimate that by the end of the seventh year not less than 20,000 houses could be erected and financed by loans from the Society.

Slum Clearance By Municipalities

We recommend that slum clearance schemes should be undertaken by the municipalities. For this to be effected, however, financial assistance must be made available, along the following lines:

1. By revenue from the municipal budget.
2. By loans from the Seven Year Plan for road improvement.
3. By capitalizing the improved value of the land.
4. By grants made through the Central Housing Authority.

Before a slum clearance scheme can be commenced it is necessary to build alternative accommodations for those being displaced. This may be done with the assistance of Central Housing Authority grants. The revenue available from the municipal budget is limited, but in most instances allowance is made in road schemes for compensation to be paid for houses demolished. This compensation is usually assessed to be approximately half the cost of a new house. It is suggested that, instead of a cash compensation being paid, alternative new accommodation be provided, for which the municipality will pay half, the Seven Year Plan one-quarter and the new owner one-quarter of the total cost. This scheme will need individual study for each area.

Road improvements will be a feature of the replanning of the towns, and it is recommended in the chapter on town improvements that loans should be available from the Seven Year Plan for this purpose.

When slum areas are redeveloped it can be expected that in many instances there will be a considerable improvement in the value of the land. It has been recommended that the municipalities should have the right to acquire and sell property and thus should be able to take advantage of the improved value of that land not required by the municipality. In the principal towns this improved value is likely to be considerable.

The grants available from the Seven Year Plan will be advanced against individual schemes and may require adjustment. It is suggested, in the first years, that the grant should be computed on the basis of a flat rate for each new dwelling unit provided, and might be equal to 25 per cent of its cost. It is not intended that these grants should be repaid or bear any interest.

A sum of Rls. 300,000,000 has been allocated for slum clearance, of which Rls. 10,000,000 will be required in 1329. We have estimated that at least 12,000 new houses would be provided in connection with the slum clearance schemes. This number could be greatly increased if municipalities take full advantage of improvement values in land and use this money for re-housing.

Subsidies for Housing

It is intended that funds under this heading should be used for providing a subsidy for those schemes where the houses are to be rented and which cannot be self-liquidating. The subsidy will be available primarily for municipal housing schemes financed by municipal loans, but it can be used on schemes carried out by authorized undertakings. It will be adjusted for individual areas and may take the form of a subsidy on the rent or an initial grant to enable the housing project to be commenced.

For the first years it is visualized that the actual housing project will be executed by the Authority until such time as the municipality can take over this function, but that the management will be by the municipality. The housing schemes will be partly financed by the grants from the municipal budget and partly by money borrowed by the municipality at normal interest rates. It is suggested that the municipality should endeavor to interest local public-spirited people to take up low-interest-bearing bonds to enable schemes to be carried out.

A sum of Rls. 300,000,000 has been allocated for this purpose, Rls. 10,000,000 being required in 1329. It is estimated that these subsidies will provide aid for 15,000 houses.

Industrial Bank and Factory Owners

The Industrial Bank has prepared draft plans for providing houses for the workers at the new sugar factory at Rezaiyeh, and tentative proposals have been put forward for houses at the Tehran cement plant. Since land is available, it should be possible to commence work on these housing schemes in the first years. The loan will be at a low rate of interest and will be repaid over a reasonable period of years, say 10 to 20 years. The repayments during the period of the Seven Year Plan will be used for the erection of additional houses.

A total sum of Rls. 100,000,000 has been set aside for providing loans to the Industrial Bank and others, allocated as follows:

1329	Rls.	50,000,000
1330		50,000,000

It is estimated that the funds allocated will be sufficient for 1,300 houses.

Miscellaneous Grants

The total funds allocated under this head amount to Rls. 65,000,000, of which Rls. 5,000,000 will be required during the last half of 1328 and Rls. 10,000,000 during 1329.

These funds will be at the disposal of the Central Housing Authority to be used for the following general purposes:

1. Erection of experimental houses. This will be carried out in the first and second years of the program. It is suggested that 12 such houses be erected in Tehran and 6 in each ostan. The houses will subsequently be handed over to the municipalities for renting.

2. Grants to welfare organizations to assist in the carrying out of social studies. This will be most important during the first and second years, but some social studies must be continued throughout the Seven Year Plan period.

3. Grants to the Department of Agriculture for providing basic materials and builders' supplies for use in rural housing.

4. Grants for the bulk ordering and purchasing of imported materials required for the Government-sponsored houses.

5. Grants to selected personnel to make tours abroad to study housing conditions.

6. Grants for the establishment of a plant-hire organization, until such time as it can be taken over by private enterprise.

The Housing Program Year by Year

The program set out below is based upon the assumption that the necessary legislation will be speedily enacted. Some parts of the housing program will also be dependent upon the execution of other works envisaged in the Seven Year Plan. This is particularly the case with the provision of potable water supplies and the proper planning of the town.

Year 1328

The last six months of the year must be devoted to organization and legislation. It would be impracticable to commence any building operations without adequate preparation, especially in view of the limited number of months available for building operations. We recommend the following program:

1. The setting up of the Central Housing Authority complete with full legal authority.
2. The revision to the charter of the Mortgage Bank, allowing it to operate as a building loan society.
3. Legislation regulating the acquisition of land and property.
4. Carrying out of social studies and the collection of data and statistics.

The total amount allocated for use during the year is Rls. 10,000,000.

Year 1329

During this year all recommended legislation should be enacted and a commencement made on a limited number of housing projects. The following is the recommended program:

1. Legislation giving the municipalities power to carry out slum clearance schemes.
2. Legislation giving the municipalities power to undertake housing schemes.
3. Legislation giving the Central Housing Authority power to require the municipalities to take action in providing houses.
4. Legislation giving powers of condemnation.
5. Legislation amending the Rent Control Act.
6. Legislation controlling house design and construction.
7. Grants to municipalities for the purchase of land required for housing schemes. Preparation of housing schemes for these sites.
8. Commencement of limited housing schemes in the following towns:
   a. Meshed, where there is acute unemployment and it is believed land could be readily leased from the Holy Shrine.
   b. Resht, where overcrowding is becoming a serious danger and there appear to be suitable sites available for housing schemes.
   c. Kermanshah, where suitable Government-owned land appears to be available for development.
   d. Tehran, where housing is needed to accommodate people soon to be displaced by redevelopment of slum areas.
9. Loans made to the Building Loan Society. For this year it is suggested that the loan should be equally divided among ostans, with an initial capital of Rls. 10,000,000 for each. The Building Loan Society will make advances for house purchases during the year and will open up new branch offices.
10. Loans made to the Industrial Bank and commencement of approximately 600 houses.
11. Building of experimental houses, 12 in Tehran and 6 in each ostan.

The total amount allocated for use during the year is Rls. 195,000,000.

Year 1330

This year should see the commencement of a number of housing projects in each ostan. The Central Housing Authority will be in a position to assess accurately the housing requirements of the country as a whole and should be able to estimate the amount of co-operation to be expected from private enterprise. A country-wide campaign to accelerate all housing programs should be carried on this year. This effort will include additional loans to the Building Loan Society and the Industrial Bank, and the commencement of slum clearance schemes and housing projects in the principal towns.

The following housing projects should be started:

1. Tehran. The development of new areas to rehouse the inhabitants from parts of the southern area which is to be redeveloped.

2. Meshed. The development of new areas, the erection of houses by private enterprise and the municipality.

3. Isfahan. The development of new housing estates by the municipality for re-housing. The commencement of a redevelopment scheme for the northeast area of the town.

4. Resht. The development of new areas by the municipality and the erection of houses by private enterprise, financed by the Building Loan Society.

5. Shiraz. The development of new areas by the municipality and the erection of houses by private enterprise and the municipality. The redevelopment of parts of the southeast area of the town, including road improvements.

6. Kermanshah. Continuation of the housing project begun the previous year. Commencement of slum area redevelopment.

7. Hamadan. Development of housing estates to re-house those from the eastern area of the town which will be redeveloped.

8. General. In all other towns some houses will be commenced, mostly by private enterprise financed by the Building Loan Society.

The total amount allocated for use during the year is Rls. 330,000,000.

Years 1331 to 1335

The allocation of funds for this period is Rls. 965,000,000.

Foreign exchange will be required for the purchase of materials necessary in house construction, for foreign experts, for foreign travel and study, and for builders' plant. Foreign exchange requirements are difficult to assess because of a number of influencing factors. Our estimate is based on the rial expenditure available in the Seven Year Plan and takes no account of the contribution by municipalities or private capital. On this basis we estimate that foreign exchange will be required equivalent to Rls. 110,000,000.

The budget allocations and foreign exchange requirements are shown tabulated in Exhibit G-1.

POTABLE WATER SUPPLIES

INTRODUCTION

To the great majority of the inhabitants of Iran water is the principal problem of life. The bulk of the people are still dependent for water on sources that have been in use for many centuries, with the result that only in few instances do these provide today a supply satisfactory in both quantity and quality. The demand for water is steadily rising and can be expected to continue to do so, not only on account of population increases but also in view of the tendency for living standards to be improved. It is now generally accepted that adequate water supplies are essential to the welfare of the people.

In this section we are concerned only with water for domestic consumption, a subject that lends itself to treatment in two main parts:

1. Domestic water for rural communities.
2. Domestic water for urban communities.

The total sum allocated to water supply and power plant schemes under the Seven Year Plan is Rls. 1,000,000,000. For provisional planning purposes we have assumed that 75 per cent of this amount would be set aside for water supply and the remaining 25 per cent for power plant schemes.

RURAL COMMUNITIES

We include in rural communities all those with a population of less than 10,000 inhabitants. It is estimated that they comprise some 80 per cent of the total population of the country.

Appraisal

The rural communities rely for their domestic water on kanats, wells, rivers, and springs. The supply is not always constant or adequate and some areas are affected by consecutive years of low rainfall, which brings great hardship on the people. Frequently whole valleys are abandoned when the source of supply fails. In other areas, where there is an adequate surface water supply available, no measures are taken to protect the supply, which becomes polluted by both man and beast.

Water Requirements

The minimum daily requirements of potable water per inhabitant will vary with the locality. On the basis of water taken from a public fountain, however, it is estimated that a minimum supply of 25 liters a person per day should be provided and to this should be added, where necessary, an amount to cover the requirements of livestock. It is recommended that this figure should be adopted in planning the supply for village communities.

Recommendations

The provision of adequate and pure supplies of potable water for all communities in the rural areas is of great importance and is stressed in the section on public health (Vol. II). With the limited capital resources and technical skill available, however, it is clearly impossible to provide piped supplies. It is recommended, therefore, that potable

supplies for rural communities should be provided in conjunction with irrigation projects. The supply would be piped to a public fountain where, it is suggested, it would be available to the villagers free of cost. The village committees would be responsible for taking measures to protect the water supply from contamination. In other areas, where irrigation projects are not under consideration, technical assistance should be made available without charge to give advice on such matters as protection of supply from contamination, and installation of cheap forms of filters. The cost of carrying out the work would have to be borne by the villagers or the landowner. However, in most cases the desired improvements would entail little expenditure on materials and would depend, for the most part, on the provision of labor which the villagers themselves could furnish.

URBAN AREAS

The total population of all urban areas over 10,000 inhabitants is estimated at 3,300,000. In no town, with the exception of Abadan, is there a completely piped domestic water supply. In the towns of Tehran and Shiraz comprehensive schemes have been prepared and work has now reached the construction stage. In other towns such as Meshed, Tabriz and Bandar Abbass, steps have been taken to initiate projects although the method of financing the schemes has not been settled in all cases.

In most cases the town supply is from shallow wells or kanats with distribution through the town by means of open jubes. Frequently the supply is inadequate, particularly during the summer months when drinking water is carried into the town and sold at a high cost to the inhabitants. Pollution of the water is a constant danger in most towns, more especially in such cities as Isfahan and Resht where the supply is from wells and the water table is high.

Of recent years there has been a marked drift of population into the towns. We have covered this question more fully in the chapter on low cost housing. The effect of this movement, coupled with a general raising of the standard of living, has been to create increased demands on a water supply which, in most cases, is insufficient to meet the existing demand. This problem, already a cause of grave concern to the authorities, will become progressively more serious.

PIPED WATER SUPPLIES

A piped supply of potable water to every house is an ideal at which every municipality should aim, and one which would do much to raise the standard of living and health of the people. It will be some years before this ideal can be achieved since it involves expenditure beyond the present economic resources of the country. With the funds available from the Seven Year Plan it will be possible to provide a piped water supply to only a limited number of municipalities, and even in those cases piped supplies to many of the houses may have to await the replanning and rebuilding of large areas of the overcrowded quarters of the towns. Provision can be made for the future by so planning the distribution mains that they may be extended when the demand warrants. In the meantime, stand-posts of robust construction must provide a temporary alternative to an individual connection to each dwelling. It is considered that these are preferable to the common form of public fountain since they are less wasteful of water. They should be provided at the rate of one stand-post to a maximum of 500 persons.

Sources of Supply

The water resources of the country have been studied and covered in the section of this volume on water resources. Generally the sources of supply for potable water will be from wells, rivers and springs. We have studied the forty-five largest municipalities and consider that thirty-two should be supplied from wells, twelve from rivers and one from a spring.

Requirements

In estimating water requirements of the urban areas consideration must be given not only to the immediate needs of the inhabitants but also to the probable rise in consumption that may be expected over the next 20 years or more. Consumption per capita is liable to vary for each town, and a separate detailed study and analysis will be required. The principal factors which influence consumption are briefly as follows:

1. Municipal Usage. Municipalities require water for many purposes such as road cleaning and the watering of public gardens and trees. In many towns it may be found possible to meet this demand from existing kanats or wells, but in all other cases it must come from the piped supply. Municipal consumpton will tend to increase with the growth of the town and its importance as an administrative center.
2. Industrial Usage. With few exceptions the present types of industry in Iran are not large users of water. They should, however, be taken into account in assessing requirements and allowances made for the establishment of new industries which will make heavy demands on the water supply, for example, ice-making factories.
3. Density of Population. This is closely related to the class of inhabitant and their standard of living, poorer classes normally using considerably less water.
4. Private Gardens. The extent to which the town's water supply is used for private gardens, as also the number and area of such gardens, will affect consumption. It is expected that in some towns existing kanats and wells may be used for this purpose.
5. Metering of Water. The methods adopted for charging for water, and the metering or restriction of quantities used, have an important bearing on consumption. We have treated this matter more fully later on under the heading, "Metering and Wastage of Water".
6. Climatic Conditions. Conditions vary considerably throughout the country and have a marked effect on the domestic water consumption and on seasonal requirements.
7. Waterborne Sewage and Drainage. We have not recommended the installation of modern sewerage in any of the towns. It is desirable, however, that each urban area with a potable piped water supply should have a waterborne sewage and drainage system, and, although it cannot be undertaken during the period of the Seven Year Plan, allowances and plans should be made for its subsequent installation. The extent to which it is provided, coupled with the use made of hygienic sanitary appliances, will have an important bearing on domestic consumption.

In arriving at an estimated consumption of water per capita, the records of various towns in the East and Middle-East provide a valuable guide. The following table gives details for representative cities:

Relative Water Consumption

City	Estimated Total Population	Estimated Population Supplied	Consumption in Liters per capita of Population Supplied
Calcutta	2,109,000	1,260,000	445*
Bombay	1,489,000	1,160,000	350
Cawnpore	780,000	244,000	160
New Delhi	522,000	65,000	115
Alexandria	750,000	700,000	210
Baghdad	550,000	200,000	250
Jerusalem	170,000	160,000	60
Beirut	240,000	230,000	139
Damascus	291,000	100,000	100

* Includes approximately 200 liters of unfiltered water.

The figures for the cities of India relate to the average daily consumption; the maximum consumption per day can be as much as 50 per cent higher. The low consumption for Jerusalem arises from the limited supplies of water available.

Town Planning

The design of water supply schemes will be hampered because few of the towns have been adequately studied and relevant statistics and data collected. At the present time towns are growing and development is taking place without regard to any logical over-all plan. If this continues, designs of water supply schemes will be subject to amendments to keep pace with the new developments, and additional cost will be incurred. We have recommended that a study should be made and a draft town plan prepared for all these towns in which a piped water supply is being installed. It is also suggested that the Central Town Planning Bureau should be responsible for collecting relevant statistics for the water supply engineers.

Finance

The size of municipal budgets is small and, with the present system of taxation, cannot be expected to defray the capital cost of a piped water supply. Most municipalities, however, should be in a position to make a limited contribution to the cost. In certain instances, as at Kermanshah and Tabriz, a reserve fund has been built up for providing a water supply.

Metering and Wastage of Water

Prevention of waste is important but is not easy to achieve. Where piped supplies are made available, a continuous supply over the full 24 hours should be maintained in order to obviate the wastage due to individual storage in buckets and drums. The provision of water storage cisterns in individnal buildings should be encouraged. Where existing ambars are to be used for water storage they should be thoroughly inspected for possible leakage.

The most obvious and straightforward method of lessening wastage is by the metering of all supplies. In India it has been found that where private domestic connections are

metered the average daily consumption rarely exceeded 70 to 90 liters per capita and was frequently less. On the other hand, where the domestic connection was unmetered the consumption was excessively high. In an analysis of 136 American cities it was found that the metering of only 50 per cent of the supplies reduced the consumption from 575 liters to 230 liters per capita per day. Against the advantages of metering supplies must be set the initial cost of the system and the increased administration cost. In Iran water is a valuable commodity and therefore the installation of an individual metering system should, in our opinion, be seriously considered.

There is an alternative to metering which is particularly applicable for use in the poorer and more crowded areas, and which consists in inserting in the delivery pipe a restriction which limits the flow of water. This is an inexpensive arrangement which has been found in practice to lessen wastage. It is preferable that it should be accompanied by the installation of a cistern in the building served to avoid storage in individual containers. There are, however, certain disadvantages to its use. The restricting hole through which the water passes is extremely small and is liable to get choked, particularly if the source of supply is one which tends to run "cloudy" after heavy rain; also it has been found that, after the house cistern is filled, the overflow is allowed to run into a garden or to waste.

In all towns there will be quarters where it is not practicable to provide piped supplies to each house. For the inhabitants of these areas water must be carried from a central point. It has been found that the wastage of water from public fountains is great and it has already been recommended that stand-posts be installed in preference, fitted with a robust push type of control lever. These stand-posts should be inspected at frequent intervals.

Cost of Water

Although in many municipalities the available water supply is free to the inhabitants, the sale of pure drinking water is now an accepted feature. Thus water is normally obtained from water carts at a charge ranging from Rls. 1 to Rls. 1.5 for 20 liters, although it was reported from Kermanshah that the corresponding charge during the summer may be as high as Rls. 2.5. The cost-of-living index figures do not include information on the amount spent by the various sections of the communities in individual towns on drinking water, but it is reported that in many towns even the poorest do pay for water. It should be noted, however, that the Ministry of Labor does not include water as an item of expenditure in the worker's "food basket".

The type of tariff adopted for the sale of water has an important bearing on consumption. Reduced charges or the provision of free water may result in increased consumption and wastage. On the other hand, however cheaply the water is provided, there may remain a section of the population unable to avail itself of the supply which will continue to obtain water from contaminated sources. It may be necessary in some instances to consider the provision of free water for such persons, but we consider such practice should be kept to an absolute minimum.

Labor

It is important that the problems of securing an adequate supply of skilled labor are fully appreciated before a water supply scheme is commenced. The Plan Organization cannot be expected to deal with all the problems arising from the shortage of skilled

labor. In the case of a potable water supply, skilled labor is required for the piped installation including filtration and pump plants, but also a large force of skilled assistant artisans will be required to deal with house connections and plumbing. It is suggested that each municipality, in conjunction with the Ministry of Labor, should be responsible for undertaking training schemes for labor to meet this demand.

IMPLEMENTATION

It is considered that the following broad policy should be adopted in the provision of potable water supplies:

1. Schemes for the supply of potable water to take priority over all other water development projects.
2. The water resources of the country to be co-ordinated and controlled by a Central Water Authority (CWA), as recommended in the section on water resources in this volume.
3. The CWA to be responsible for allocating funds from the Seven Year Plan to municipalities. The CWA to be responsible for the design and construction of all schemes for which a loan has been advanced.
4. The CWA to be given statutory powers enabling it to undertake water supply schemes.
5. Water supplies for each town to be managed by a non-political water board or corporation.
6. Water to be charged at rates just sufficient to cover running costs, plant depreciation, loan charges, debt repayments and a reserve fund.
7. Legislation to be introduced with a view to preventing misuse, waste and pollution of water.

Central Water Authority

It is intended that the CWA should accept the responsbility of implementing the policy for the provision of potable water supplies, as set out in the preceding paragraph.

The CWA would be expected to prepare draft legislation for the establishment of water boards. They should also issue, for the guidance of all newly-formed water boards, a model set of bylaws required for the efficient operation and management of the undertakings and for the protection of the water sources and of the waterworks property.

Supply Authorities

In most towns the municipality is the responsible authority for the supply of water, paying all charges and carrying out all necessary maintenance work. Of the two piped water supply schemes under construction in Iran at the present time, that at Tehran is being sponsored by the municipality and that at Shiraz by private enterprise. The provision of a water supply is a matter which directly concerns the whole commmunity. It is therefore reasonable that some form of control should be exercised over the supply authorities. Furthermore, the provision of water to many areas, in particular to the poorer quar-

ters of the towns, is not an economic proposition judged solely in the light of revenue received from water sold.

For all water supply schemes financed by loans through the Seven Year Plan it is necessary to consider the question of ownership of the undertaking and the form of management. The undertaking should be under public ownership since it will be sponsored by the municipality and financed by Government funds. It is recommended that the management be a corporate body, such as a board, commission or corporation for the following reasons:

1. The organization would be self-contained and self-supporting.

2. Its powers could be defined by statute and its financial authority limited to the administration of special loans and of the revenue from the sale of water and water fittings.

3. It would be non-political and solely responsible to the public.

4. The appointments to the board would be long-term. In addition, they would overlap sufficiently to ensure a continuity of policy such as would not occur under a continually changing municipal board.

5. There would be no question of revenue from the water supply undertaking being used to supplement the municipal budget.

It is suggested that the board be composed of five members appointed for a term of six years, except that on the formation of the board some appointments would be for two and four years only so as to provide for overlapping terms of office. Appointments to the board would be made by a panel of trustees consisting of local notables, for example, the President of the Municipal Council, President of the Chamber of Commerce, the Chief Justice and the Directors of Health and Education.

The board should be given full statutory powers which would authorize its formation, define its duties and responsibilities and grant powers for the making of bylaws and provide for their legal enforcement. It is strongly recommended that the board be appointed in advance of the completion of the water supply system and preferably during the initial construction stages. This would give it time to carry out such preliminary work as the organization of the undertaking and the approval of bylaws which must be operative at the time the system is completed. It is of the utmost importance that at least part of the proposed management, administrative, technical, accounting and revenue-collecting organization should be functioning efficiently when the first part of the water supply system is put into commission.

Financing of Water Supply Systems

The supply of potable water is regarded as an essential social service, and water supply undertakings therefore should operate as non-profit institutions. The revenue received from the sale of water should be sufficient to cover operating costs, a reserve fund for minor future developments, loan charges and debt repayments. Where it is found necessary to provide water to any section of the community free of cost, payment should be met from the municipal budget and should not be, in our opinion, a charge on the water supply undertaking.

The terms of the loan should receive careful consideration, since it will have an important bearing on the charge which must be made for water. We have set out below the yearly interest and redemption charges which must be paid at varying terms on a loan of Rls. 10,000,000.

In Thousands of Rials

Rate of Interest in per cent	15 Years	20 Years	25 Years	30 Years
4	899	736	640	578
5	963	802	710	651
6	1,030	872	782	726
7	1,098	944	858	806

We have prepared a further table to show the estimated yearly total operating costs, including the above debt charges, running costs, depreciation and reserve fund, for a supply undertaking where the loan covers the total capital cost of the water supply scheme. These estimates are based on a capital cost of Rls. 10,000,000, with loans repayable at varying terms.

In Thousands of Rials

Rate of Interest in Per Cent	15 Years	20 Years	25 Years	30 Years
4	2,100	1,935	1,840	1,780
5	2,165	2,000	1,910	1,850
6	2,230	2,075	1,980	1,925
7	2,300	2,145	2,060	2,005

We are not in a position to make recommendations as to the terms of the loan, but we believe the above tables will be useful to the Plan Organization in arriving at a decision. The importance of a low rate of interest is self-evident. It is recommended that, where loans are made for water supply schemes, payments toward amortization should not commence until the expiration of an agreed period after the system has come into operation. This would normally be two to four years.

It is our opinion that loans should not be advanced up to the full capital cost of the water supply scheme, but that the municipality should bear part of the expenditure. This proportion will vary, but it is considered it should be between 15 and 30 per cent of the total capital cost. In some instances municipalities have reserve funds available which could be used for this purpose while in a few towns the necessary funds could be obtained from successive budgets. For the remaining towns, however, alternative methods will have to be adopted. These might be by direct taxation, the sale of special bonds, or the levying of a special assessment. We consider that the last named method will be found to be most applicable and equitable, since the installation of water mains usually increases the value of property. The special assessment could be a flat rate charged on the length of frontage of the property.

Applications for loans will normally be made by the municipality and be based on preliminary estimates prepared on their behalf by the CWA. Immediately upon its formation the water board will accept responsibility for the loan and for its repayment in

accordance with its statutory powers. The handling of the funds, including those advanced by the municipalities, however, must be with the CWA who will be responsible for all matters affecting design and construction of the water supply system. In this way delays due to divided responsibilities may be avoided.

The charge for water must cover the total operating costs, but these cannot be estimated for a scheme until it has been studied and preliminary designs prepared. Construction costs for schemes will vary with the town, so that water charges must also vary throughout the country. It may also be necessary to adjust charges in the light of experience gained in the operation of the scheme. From our knowledge of water supply schemes recently installed in other parts of the world and a study of the two schemes under construction in Iran, we believe that it should be possible to provide water at a charge varying between Rls. 2.5 and Rls. 3.5 a cubic meter. This compares with the present price of drinking water supplied by carriers of between Rls. 50 and Rls. 125 a cubic meter.

Legislation

In order that the program for domestic water supplies can be implemented, legislation will be necessary as follows:

1. Legislation authorizing the requisition of land. This is covered in the section on legal matters (Vol. V), which would give the Council of Ministers power to delegate such authority as needed.

2. Legislation authorizing the establishment of a Central Water Authority.

3. Legislation authorizing the establishment of water boards. It is suggested that this act should be drawn up to apply, in general terms, to the whole country, but the variations required to meet individual localities would be dealt with by a decree of the Council of Ministers. It is expected that the legislation would include the following broad subjects:

   a. Qualification for membership of the board, appointment and removal from office.

   b. Power of the board to draft and promote bylaws.

   c. Financial provisions.

   d. Duty of the board in respect to management and operation of the undertaking.

   e. Duties and powers of the board in respect to protection of water sources and water supply property.

   f. Powers to acquire easements.

   g. Duty of the board to supply water, with provisions as to pressure of supply, constancy and quality.

   h. Power of the board to lay mains, break open streets, etc.

4. Legislation to prevent misuse, waste and pollution of water. This would cover interference with water supply systems, pollution of sources of supply and unauthorized use of water. Penalties should be prescribed for offences.

WATER SUPPLY PROGRAM

In order to prepare a program of projects and to apportion the available funds it is necessary to make a number of broad assumptions.

In the first place it must be assumed that work on the provision of domestic water supplies will continue beyond the period of the Seven Year Plan. Thus some of the work initiated during the Seven Year Plan will not be finished until some years later. The total cost of all the proposed schemes exceeds by Rls. 340,000,000 the amount available from the Seven Year Plan. Such excess will be carried forward to the subsequent years and would no doubt be financed by means of a further loan. At the expenditure rate visualized, it represents only two years additional work.

In the second place we have assumed that the municipality will contribute toward the capital cost of the scheme, and our estimates have been prepared on the basis that the overall average amount of such contribution would be 20 per cent of the total cost. The figures quoted in the tabulations which follow represent the actual sums to be made available from the Seven Year Plan and exclude the contribution of the municipality.

Thirdly, we have allowed for a population increase of 20 per cent above the present estimated figures. Similarly we have assumed an average overall daily consumption of 125 liters per capita. The designs of the water supply schemes should, however, allow for expansion to meet increases of both these figures.

All estimates include professional fees and such administrative charges as would be made by the Central Water Authority. They cover the cost of the water supply distribution only, and no allowance has been made for connecting up to individual houses or to the cost of organizing the water board. These two charges, it is considered, should be met from the municipal budget or by loans, until such time as the water board is functioning.

Program of Projects

The provisional program of projects indicates an order of priority for the work, but it is not intended that this should be rigidly adhered to. In selecting projects we have been guided by the present needs of the town and by the expected effect on the town of future developments under the Seven Year Plan. In general, all towns with a population in excess of 50,000 have been included in the program. Revisions and amendments to the program can be made following a more detailed study of the country.

We have indicated dates for the commencement of the design and construction of each project. It is of the utmost importance that adequate time should be given to the preparation of the design. We have allowed a period of 15 to 24 months for this work according to the size of the project, but there is everything to be gained by commencing preliminary studies well in advance of this time. This will be the responsibility of the Central Water Authority, assisted by consultants and expert advisers.

In our opinion the program proposed will tax the resources of the country to the full. If it is found that the municipalities can make a greater financial contribution than we have estimated, it will not follow that additional projects can be implemented, since the amount of work undertaken is likely to be limited by the availability of labor, skilled technicians and competent contractors.

Provisional Program of Water Supply Schemes

Priority	Town	Year Studies and Design Commenced	Year Work Commenced	*Estimated Cost in Thousands of Rials
1	Meshed		1329	120,000
2	Bandar Abbass		1329	10,000
3	Bushire	1329	1330	15,000
4	Kerman	1329	1330	40,000
5	Kermanshah	1329	1330	60,000
6	Hamadan	1329	1330	75,000
7	Tabriz	1329	1331	150,000
8	Yezd	1330	1331	40,000
9	Naiin	1330	1331	5,000
10	Iranshahr	1330	1331	5,000
11	Resht	1330	1332	70,000
12	Isfahan	1330	1332	110,000
13	Ghum	1331	1332	50,000
14	Rezaiyeh	1331	1333	30,000
15	Ahwaz	1332	1333	30,000
16	Kazvin	1332	1333	50,000
17	Arak	1333	1334	40,000
18	Kashan	1333	1334	40,000
19	Ardebil	1333	1334	50,000
20	Zenjan	1334	1335	30,000
21	Khoy	1334	1335	20,000
22	Babul	1334	1335	20,000
23	Dizful	1334	1335	30,000
	Total			1,090,000

* The estimated cost excludes the contribution to be made by the municipality which it is assumed will be 20 per cent of the total cost.

Allocation of Expenditure by Ostans

The following table indicates the expenditure by ostans. It will be noted that the estimated expenditure for Ostans 6 and 7 is low. Both these ostans are exceptional in that the two principal centers of population, Abadan and Shiraz, either have, or are being provided with, a piped water supply.

Allocation of Estimated Expenditure by Ostans

(In Thousands of Rials)

Ostan	1	80,000
	2	55,000
	3 & 4	160,000
	5	135,000
	6	20,000
	7	15,000
	8	55,000
	9	120,000
	10	110,000
		750,000

Yearly Allocation of Expenditure

The table in Exhibit G-1 gives the budget allocations and foreign currency requirements. During the first years of the program it will be advisable to order in advance certain materials for which foreign exchange is required. For this reason the ratio of foreign exchange to local currency will be relatively high in those years.

Special Comments

This portion of the report should be read in conjunction with the section on water resources in this volume.

We have not recommended that any waterborne sewage and drainage schemes be constructed under the plan. Funds are not sufficient for the execution of modern sewage schemes, and poorly conceived and badly executed "cheap" schemes would in many ways make present conditions worse. The absolute first priority must be for potable water schemes. The experience gained not only in the construction, but in the operation of such schemes could then be capitalized at a later stage. Iran is fortunate that in general the water table is deep below the ground surface and down drainage is good. The exceptions are Ahwaz, Resht and Isfahan. But it must be clearly understood that a program of sewage and drainage construction will have to follow soon after the completion of individual potable schemes. Consequently the necessary plans and studies must be made during the Seven Year Plan, and the Water Authority should devote attention to the matter.

We recommend that project plans should be completed for the early installation of sewage and drainage schemes at Ahwaz, Resht, and Isfahan. If any "contingent" funds become available to the Plan Organization from works scheduled elsewhere in the report but not proceeded with, we recommend that a proportion of these funds be devoted to these schemes.

The Tehran water supply scheme is undoubtedly the largest scheme of this type at the present time undertaken in the Middle East. Apart from the great needs of the city it is essential that the capital city should set an example to the rest of the country with regard to construction, operation and management. The water laboratory scheduled to be operated in Tehran should become the National Laboratory for Iran, and the center for training Iranian chemists dealing with water supplies and pollution. The Plan Organization, and the Central Water Authority should spare no efforts to ensure that this courageous scheme goes forward and is successfully completed at a very early date.

MODERN PRISONS

The state of the prisons throughout Iran is unquestionably bad, a fact recognized by the Provisional Planning Board in allocating a sum of Rls. 200,000,000 for the construction of modern prisons. It will be appreciated that it is difficult for us to justify the inclusion of this sum of money in the Seven Year Plan program which aims at improving the economic condition of the country. While we fully agree with the need for improving the present prisons, we consider that the cost of this work would be more appropriately included in the national yearly budgets for the construction of public buildings. We therefore recommend that the sum of 200,000,000 rials be transferred to a contingency fund to be used for Plan purposes as described elsewhere in our report. As regards the modernization of prisons, we offer comments only.

APPRAISAL

By and large, prison accommodation in Iran is totally inadequate. At Meshed the existing building is suitable for accommodating approximately 300 prisoners, but the number of prisoners held at the present time is over a thousand. It is not unusual to find 6 or 8 prisoners in a room of only 60 cubic meters.

Few of the existing prisons have been designed for their present purpose. For the most part they are rented buildings that have been converted into prisons. At Tabriz, for example, an old German carpet factory is used as a prison; it is seriously overcrowded, badly infested, a danger to health and costly to maintain.

Some of the prisons are centrally located in towns on sites which could be used to greater advantage for other purposes. This is the case in Isfahan, where the present prison, a very old, unhygienic, circular building, is close to the Maidan Shah and directly adjoins a school. It is hoped that the prison can be located outside the town, and so leave the existing site available for future expansion of the school.

Because of the shortage of accommodation all classes of prisoners are often to be found in the same prison, although, as far as possible, they are segregated. Thus male and female prisoners serving a life sentence, those on remand and awaiting trial, and juvenile delinquents are usually housed in the one prison compound.

Prison training is being carried out at a number of centers, but is necessarily limited by the shortage of accommodation and equipment. Reports indicate that it can be very successful and there appears to be a desire to extend the scope of the training. It is stated that, at Tabriz and Resht, prisoners are used successfully on the normal maintenance work of the prison. They receive a small weekly wage.

REQUIREMENTS FOR NEW PREMISES

The Ministry of Justice in the Seven Year Plan considered that the following new buildings were required:

20	prisons	each	to	accommodate	600	prisoners
20	"	"	"	"	300	"
10	"	"	"	"	1,000	"

This is a total of 50 buildings to accommodate 28,000 prisoners. The estimated cost was given as Rls. 1,260,000,000, excluding the price of land, or an average of Rls. 45,000 per prisoner accommodated. The Provisional Planning Board in its report considered that 60 new buildings were required to accommodate 27,400 prisoners. It was estimated that this would cost Rls. 600,000,000 including the price of land and was based on an estimated cost of Rls. 20,000 per prisoner accommodated.

It will be noted in comparing these two reports that, while there is a considerable divergence in the number of new buildings required, the total number of prisoners to be accommodated is, for practical purposes, the same. We have been unable, in the time at our disposal, to obtain any supporting data for these figures. Questionnaires forwarded to the chief justice of each ostan had not been returned in time for the answers to be analyzed. As a result of our field studies, however, we believe that the immediate requirements for accommodation are considerably less than the estimate prepared by the Ministry of Justice. For example, at Isfahan it was stated that a new building to accommodate 400

would meet the present situation, whereas the estimated requirements are given as 1900 prisoners. Similarly, at Kermanshah a figure of 400 was given as compared with an estimate of 1900, and at Tabriz 1000 compared with an estimate of 1900.

We have found it equally difficult to reconcile the proposed location and capacity of the prisons as put forward in the Seven Year Plan report. The number of prisoners to be accommodated appears to bear no relation to the population of the town or of the ostan which it will have to serve. Thus three new buildings, to accommodate a total of 1600 prisoners, are proposed for each of the towns of Meshed, Kermanshah, Shiraz, Ahwaz and Kerman, although there is a considerable difference in the population of these towns and of their ostans.

Estimated Costs

From our preliminary studies we consider that the estimated cost of Rls. 20,000 per prisoner used by the Provisional Planning Board is reasonable. This figure, however, may require amendment as a result of further detailed studies following along the lines set out below. It should be noted that this estimate does not include the price of land or the provision of quarters for the guards or prison officers. After making provision for these items, we consider that the funds allocated under the Seven Year Plan would be sufficient for the construction of new prisons to accommodate 7500 male and female prisoners.

Design of New Prisons

A new prison is under construction at Tabriz but its design does not appear to have been fully considered. The choice of site is not ideal, as it has involved a high expenditure on preparatory works and will prove difficult to guard. The detail design of the buildings does not pay sufficient regard to security and control. We are given to understand that the authorities responsible for running the prison were not consulted during the design stage. At Resht the design of the new prison wing is good, but a shortage of capital has prevented the erection of necesary kitchen and washing facilities.

GENERAL COMMENTS

We consider that it would be unwise to prepare a detailed plan for the construction of modern prisons based upon the information at present available. We therefore consider that immediate steps should be taken to collect additional data and statistics to enable a building program to be formulated for each ostan. This should include the following:

1. A survey of all existing prisons.
2. Statistics as to the incidence of crime.
3. Statistical records of male, female and juvenile criminals.
4. Training facilities.
5. Estimate from each ostan of immediate prison requirements.

Setting Up a Commission

It would be advisable to appoint a commission to study penal reform, prison design, and administrative control of prisons. It is suggested that the commission should include an experienced penologist, a health expert, a member of the Ministry of Justice, a member

of the Police Department, and a qualified architect and engineer who would assist on matters connected with design. It is considered that the terms of reference in connection with the study of prison design should include recommendations on the following:

1. Choice of site and location with respect to the town.
2. Amount of land required.
3. Segregation of male and female prisoners, different classes of prisoners, juvenile delinquents.
4. Security measures to be adopted.
5. Minimum standards of accommodation, including size and number of prisoners per cell.
6. Health provisions and minimum sanitary requirements.
7. Facilities to be provided for education and training.
8. Kitchen and laundry facilities to be provided.
9. Structure and design, including orientation of the buildings.
10. Housing accommodation for prison guards and officers.

The commission should submit an interim report dealing with the question of land requirements for prisons in order that sites could be acquired for new prisons pending the submission of the final report. This would enable design work to be commenced immediately upon receipt and acceptance of the commission's findings.

APPENDIX G-1

BRIEF APPRAISAL OF PLANNING PROBLEMS IN THE LARGER TOWNS OF IRAN

TEHRAN

It has been estimated that the population of Tehran increased from 475,000 in the year 1319 (1940) to 800,000 in 1326 (1947). This trend continued in 1327, though it is not known to what extent. The rapid rise in the number of the city's inhabitants, coupled with the fact that a completely piped water supply scheme is being installed, has caused the price of land to reach inflationary levels. The Council of Ministers recently issued a decree establishing the boundaries of the city, with the object of imposing a limit to its growth. We are of the opinion, however, that if the movement into Tehran is not curtailed, and the town is not allowed to expand naturally, the population will merely tend to increase in density. On the other hand, it is equally important that the size of the city should be limited if it is not to become a drag on the economy of the country.

It has been estimated that nearly half the population is living in an area to the south and southeast of the town, which occupies less than one tenth of the total area of the municipality. The value of this land has been estimated to be between Rls. 600 to Rls. 2,000 per square meter, but, owing to its proximity to the business center, there is no question that, given proper development, it could be sold at a considerably higher figure.

The presence of a large market and a large working population will provide strong inducement for industrialists to establish their factories in and around Tehran. To date the location of industry in the capital has been undertaken in a haphazard manner, more to suit the convenience of the individual industrialist than that of the community as a whole.

MESHED

Meshed is the holy city of Iran and is an exceptionally fine center. Some progress has been made in the planning of the town, but it still retains a large area of overcrowded and insanitary houses. It is contemplated that a water supply scheme will be installed in Meshed and this makes it necessary to consider, at an early date, the planning of the whole of the town.

TABRIZ

By comparison with most towns Tabriz is well maintained and has a high percentage of its streets asphalted. The population appears to have remained fairly stationary over a period of time, so that the town does not suffer from the same grave defects as Tehran. The new streets which have been laid out have not followed the usual grid iron pattern and it should be possible to carry out new road schemes without such heavy compensation costs as are involved in other towns.

ISFAHAN

The population of Isfahan has been growing, probably due to the various industries which have been set up in the southern part of the town. Certain road improvement works have been carried out recently and have invariably followed the grid iron pattern. Isfahan is famous for its gardens, but we note a tendency for these to be sold under economic

pressure. It is apparent that the price of land is rising and, unless checked, will inevitably result in the sale of gardens within the town for building purposes.

The municipality has prepared provisional schemes for the construction of new roads through the northern areas of the town. This will involve the demolition of approximately 1,000 houses and, in our opinion, should not be undertaken at the present time when there is such a grave housing shortage.

SHIRAZ

The population of Shiraz has been steadily increasing, and it can be expected that, when the water supply and certain industrial installations are completed, there will be a further expansion. In the past few years the municipality has completed part of its road reconstruction scheme and this has been a notable achievement. We found in Shiraz a very noticeable civic consciousness on the part of the inhabitants, and it is worth pointing out that the amount of money spent on capital expenditure in Shiraz is higher in proportion than in any other city in Iran. Shiraz, however, is confronted with serious overcrowding in the bazaar area, where it is estimated there is a population of nearly 70,000. It will be many years before this problem can be successfully resolved.

The town is tending to develop toward the west. As in the case of Isfahan, the price of land is rising and there is danger that many of the fine gardens in the town may be sold for building sites.

RESHT

The population of the town has been rapidly increasing, due possibly to its fortunate economic situation. It is the center of a wealthy and prosperous agricultural area and is one of the few localities where unemployment is not a serious problem. Cost of building is high, with the result that little development has taken place during the past ten years.

There are three good main roads into the town, asphalt-surfaced and tree-lined, but the road communications within the town itself are poor, consisting of winding kuchehs seldom wide enough for two vehicles to pass. Many of these kuchehs, however, are ideally suited to pedestrian traffic, and afford good protection from wind, rain and sun.

The town itself is picturesque, with many of the buildings of local brick and all roofs covered with a clay tile. Repair and maintenance of the buildings, however, is very poor. The houses are seriously overcrowded, there being on an average 15 persons to each house, and considerable expansion of the town is to be expected. Suitable building sites are available which would permit of early development.

To the northeast of the town abandoned clay pits are now full of stagnant water and provide a breeding ground for mosquitoes. There are many other instances of standing water and, as would be expected, malaria is prevalent. In addition, the incidence of tuberculosis is high.

HAMADAN

It is estimated that the population of Hamadan is declining, due mainly to the prevailing economic conditions. The town is on the site of one of the ancient cities of the world and in part is well elevated above the surrounding countryside.

Three wide main roads have been constructed through the town, meeting at a central island; these are not surfaced, although it is proposed to carry out this work in the coming year. The construction of a fourth road has begun, but difficulty is being encountered due to the sudden changes in ground levels. Road communications within the town are poor. A large area of the town consists of single-story houses of sun-dried brick construction.

Climatic conditions are severe. During winter heavy falls of snow occur and the town is often cut off for long periods. The snow and the cold weather curtail the building season to about six months. There is no industry apart from the cottage industry of rug making.

KERMANSHAH

The population has been steadily increasing, due possible to the fact that Kermanshah is the center of a productive agricultural area and a communications center. Apart from the Kermanshah Petroleum Company, which employs 2,000 men, there is no industry in the town, and most of the inhabitants are engaged in trade. The number of shops is very high for the population of the town.

New roads, laid out on the grid iron pattern, have been constructed through the town. Further road works are contemplated.

A large area of the town consists of houses of sun-dried brick construction, most of which are overcrowded. It is expected that there will be an expansion of the town as conditions become more normal. To the north of the town the area is low-lying and infested with mosquitoes, but land is expensive, since it is good for agriculture. To the southwest land is not used for agricultural purposes and is cheap, and, although it is on rising ground, with careful planning should be suitable for building development.

EXHIBITS

ESTIMATED LAND UTILIZATION—1327

	Area (in hectares)	Per Cent of Total
Land in Farms		
Cropland		
Grains	3,305,000	2.02
Other field crops	615,000	.38
Fruits and nuts	680,000	.42
Fallow	12,000,000	7.33
Total cropland	16,600,000	10.15
Pasture in farms	160,000	.10
Farm woodlands	1,000,000	.61
Villages, village roads, wasteland and other land in farms	1,240,000	.76
Total land in farms	19,000,000	11.62
Land Not in Farms		
Forests and Ranges		
Forests	18,000,000	11.00
Grazing land outside forests	10,000,000	6.11
Total forests and ranges	28,000,000	17.11
Cities, roads and railroads	2,000,000	1.22
Wasteland		
Potentially cultivable	33,000,000	20.17
Desert and other wasteland	81,600,000	49.88
Total wasteland	114,600,000	70.05
Total land not in farms	144,600,000	88.38
Grand Total Land Area	163,600,000	100.00

Source: Handbook of Agricultural Statistics of Iran, Page 9, Gideon Hadary and Karim Sai.

Exhibit C-2

AVAILABLE WATER FOR AMR-ABAD

	From Jajirud		From Kanat		Total	
	Available liters per sec.	Used liters per sec.	Available liters per sec.	Used liters per sec.	Available liters per sec.	Wasted liters per sec.
Farvardin (April)	90	60	40	40	130	30
Ordibehesht (May)	60	60	40	40	100	0
Khordad (June)	60	60	40	40	100	0
Tir (July)	10	10	40	40	50	0
Mordad (August)	10	10	40	40	50	0
Shahrivar (September)	10	10	40	40	50	0
Mehr (October)	10	10	40	40	50	0
Aban (November)	10	10	35	35	45	0
Azar (December)	10	10	35	35	45	0
Dey (January)	10	0	35	35	45	10
Bahman (February)	10	0	35	35	45	10
Esfand (March)	90	60	40	0	130	70

Exhibit C-3

LAND USE OF AMR-ABAD VILLAGE IN 1328 AND ESTIMATED PRODUCTION AND VALUE OF CROPS

	Hectares	Yield per Hectare (kilos)	Price per Kilo	Value Per hectare	Value Total for village
Wheat	48	1,200	Rls. 4.3	Rls. 5,160	Rls. 247,680
Barley	24	1,500	2.4	3,600	86,400
Straw	(72)	2,000	.4	800	57,600
Melons	18	15,000	1.0	15,000	270,000
Cotton	18	300	30.0	9,000	162,000
Pasture and trees	4	—	—	—	45,000
Fallow	87	—	—	—	—
Villages, roads and waste	13	—	—	—	—
Total	212				Rls. 868,680

AERIAL PHOTOGRAPH

OF

AMR-ABAD VILLAGE

SHOWING 1328 CROPS

(See Exhibit C-3)

OVERSEAS CONSULTANTS, INC.

NEW YORK

1949

AERIAL PHOTOGRAPH
OF
AMR-ABAD VILLAGE
SHOWING 1328 CROPS
(See Exhibit C-3)

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

Exhibit C-5

ESTIMATED LAND USE AND VALUE OF CROP PRODUCTION FOR AMR-ABAD VILLAGE WITH MECHANIZATION AND IMPROVED PRACTICES

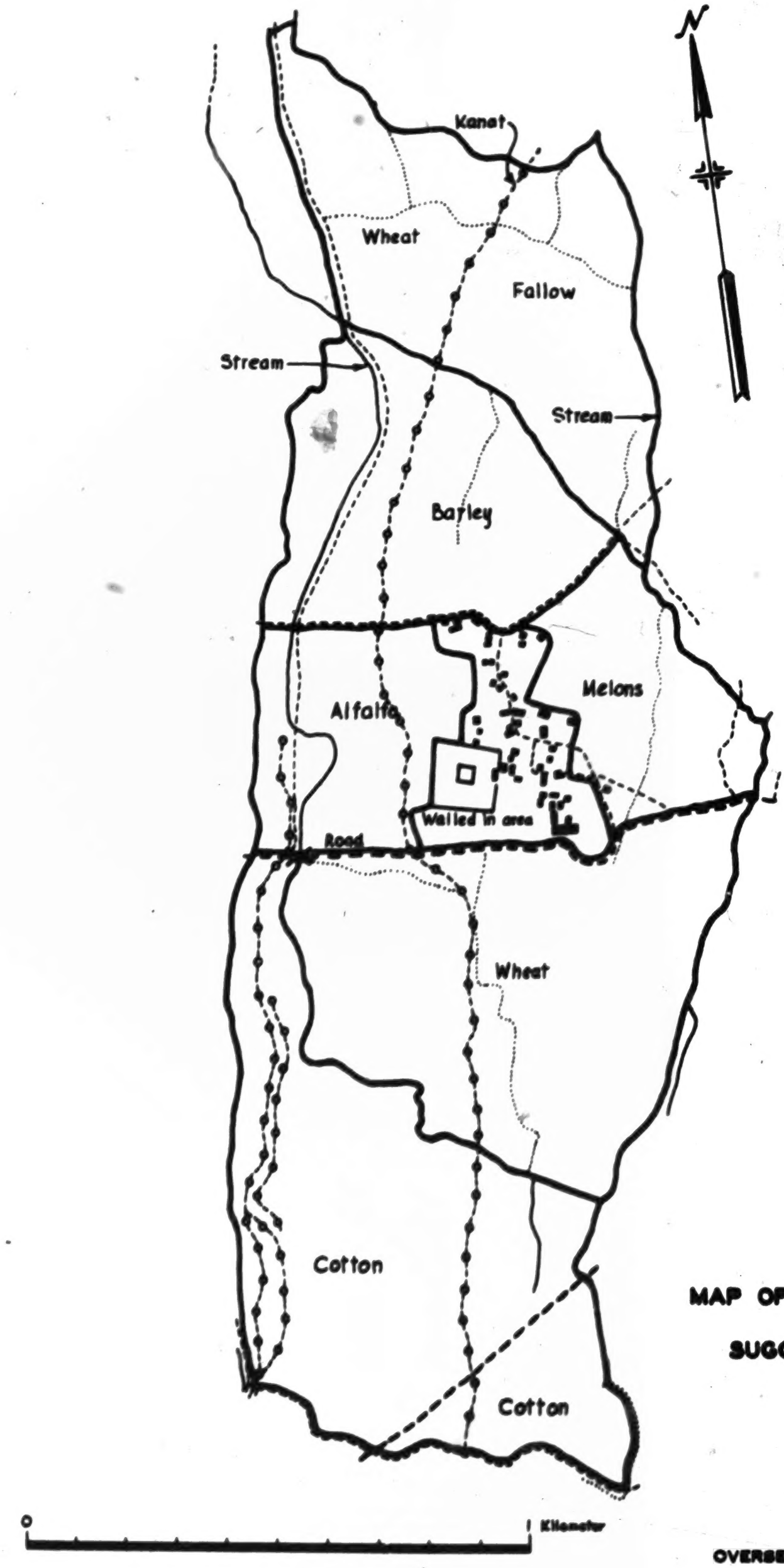
	Hectares	Yield per Hectare (kilos)	Price per Kilo	Value Per hectare	Value Total for village
Wheat	61	1,800	Rls. 4.3	Rls. 7,740	Rls. 472,140
Barley	31	2,250	2.4	5,400	167,400
Straw	(92)	3,000	.4	1,200	110,400
Melons	23	17,250	1.0	17,250	396,750
Cotton	22	345	30.0	10,350	227,700
Pasture and trees	4	—	—	—	45,000
Fallow	58	—	—	—	—
Village, roads and waste	13	—	—	—	—
Total	212				Rls. 1,419,390

Exhibit C-6

ESTIMATED LAND USE AND VALUE OF CROP PRODUCTION FOR AMR-ABAD VILLAGE WITH BOTH WATER AND MECHANIZATION ADDED

	Hectares	Yield per Hectare (kilos)	Price per Kilo	Value Per hectare	Value Total for village
Wheat	60	1,800	Rls. 4.3	Rls. 7,740	Rls. 464,400
Barley	30	2,250	2.4	5,400	162,000
Straw	(90)	3,000	.4	1,200	108,000
Melons	20	17,250	1.0	17,250	345,000
Cotton	40	345	30.0	10,350	414,000
Alfalfa	18	6,250	1.45	9,060	163,080
Trees	1	—	—	—	—
Fallow	30	—	—	—	—
Village, roads and waste	13	—	—	—	—
Total	212				Rls. 1,656,480

EXHIBIT C-7



MAP OF AMR-ABAD VILLAGE
SHOWING
SUGGESTED LAND USE

SEE EXHIBIT C-6

OVERSEAS CONSULTANTS, INC.
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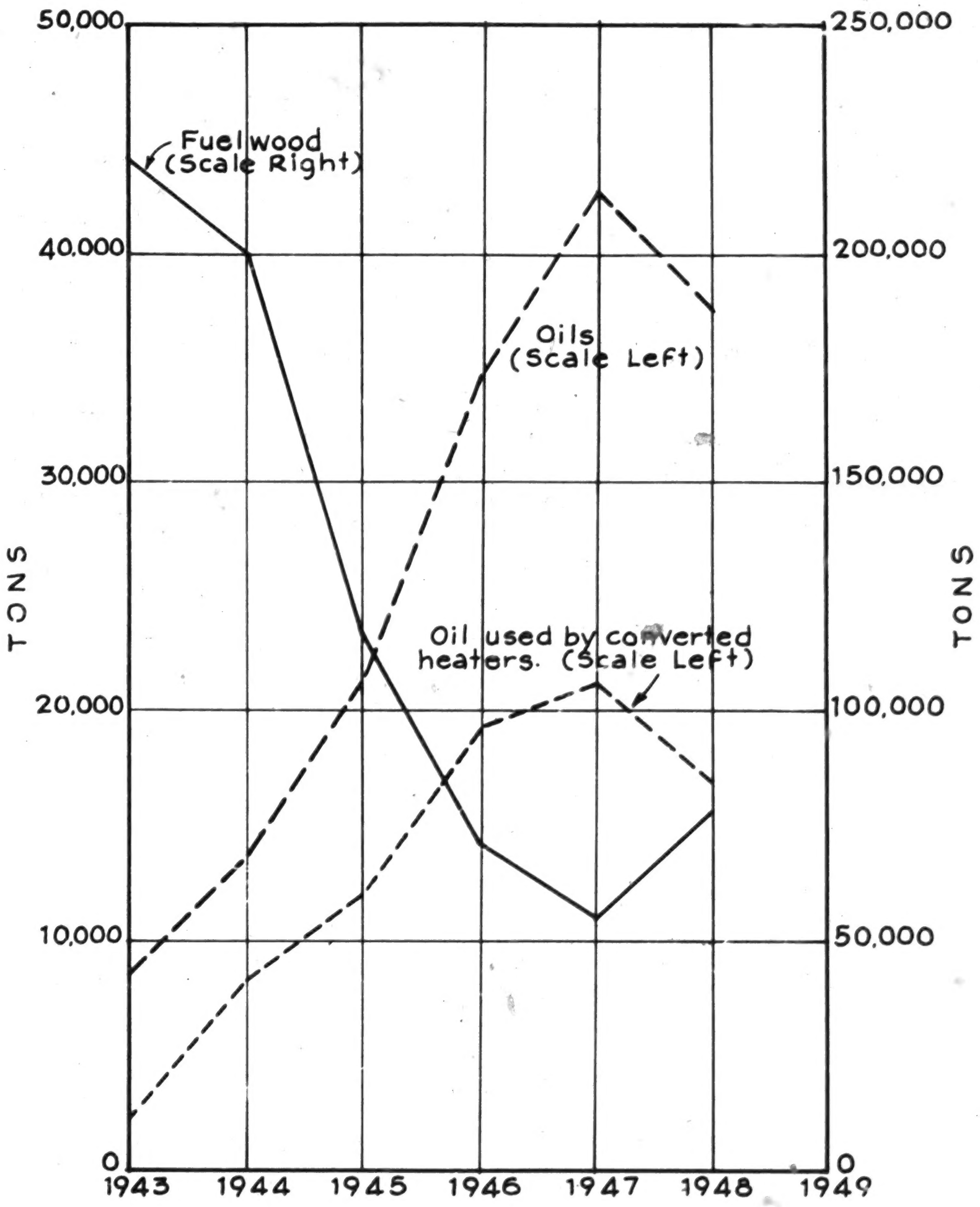
EXHIBIT C-8



CONSUMPTION OF FUELWOOD & OILS
IN CYPRUS
1943-1949

OVERSEAS CONSULTANTS, INC.
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1949

POWER AND LABOR EXPENDITURES

For Plowing

Method	Crop	Man Hours per Hectare	Animal Hours per Hectare	Labor Cost per Hectare[1]
1. Hand spading	Cotton or wheat	500	—	Rls. 2,100
2. One ox and native plow	Barley or peas	64	64	256
3. Two oxen and native plow	Barley or peas	32	64	128
4. Two oxen and steel plow	Barley or peas	24	24	96
5. One ox and native plow	Rice	144	144	576
6. Two oxen and native plow	Rice	72	144	288

[1] Man labor Rls. 35 to Rls. 50 per day.

For Growing Cotton

Operation	Man Hours per Hectare	Animal Hours per Hectare	Labor Cost per Hectare[2]
Plowing with two oxen	32	64	Rls. 128
Making border checks	650	—	2,730
Breaking clods[1]	402	—	1,690
Planting	300	—	1,200
Irrigating	275	—	1,100
Thinning	100	—	180
Weeding	500	—	900
Picking	440	—	792
Hauling in	20	20	75
Total	2,317	84	Rls. 8,795

[1] Not always needed. Figure is not included in the total.
[2] Man labor Rls. 35 to Rls. 50 per day—women Rls. 18.

For Growing Wheat and Barley

Operation	Man Hours per Hectare	Animal Hours per Hectare	Labor Cost per Hectare
Plowing with two oxen	32	64	Rls. 128
Seeding	5	—	20
Making border checks	20	—	60
Irrigating	480	—	1,920
Harvesting	100	—	500
Threshing	127	127	510
Winnowing	17	—	70
Total	781	191	Rls. 3,208

POWER AND LABOR EXPENDITURES

For Growing Rice

Operation	Man Hours per Hectare	Animal Hours per Hectare	Labor Cost per Hectare	Total Cost of Labor and Power
Plowing with two oxen	72	144	Rls. 252	1,070
Building border checks	24	—	60	60
Irrigation (included in other operations)	—	—	—	—
Transplanting	144	—	360	360
Weeding	80	—	240	240
Cutting	120	—	360	360
Carrying in	64	24	240	440
Threshing	96	72	288	800
Hulling and cleaning	480	—	1,200	1,200
Total	1,080	240	Rls. 3,000	4,530

For Growing Melons

Operation	Man Hours per Hectare	Animal Hours per Hectare	Labor Cost per Hectare[1]
Plowing with two oxen	32	64	Rls. 128
Making border checks	750	—	3,050
Breaking clods	402	—	1,690
Seeding	150	—	730
Irrigating	275	—	1,155
Weeding	240	—	432
Thinning flowers	250	—	450
Picking melons[2]	170	—	595
Carrying melons out	217	—	750
Total	2,486	64	Rls. 8,980

[1] Man labor Rls. 35 to Rls. 50 and woman Rls. 18 per day.

[2] Some flowers are picked off and small melons are covered with leaves held down with soil for protection against insects.

For Growing Dry Peas

Operation	Man Hours per Hectare	Animal Hours per Hectare	Labor Cost per Hectare
Plowing with two oxen	32	64	Rls. 128
Second plowing with one ox	48	48	180
Planting	48	24	180
Cutting and carrying	120	—	360
Threshing and carrying	24	24	72
Total	272	160	Rls. 920

MINISTER OF AGRICULTURE

DIRECTOR OF 7-YEAR PLAN

ADVISORY COMMITTEE OF 3
1-MINISTRY 1-PLANNING BOARD 1-FOREIGN ADVISER

RESEARCH AND EXTENSION INSTITUTE
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ASSOCIATE DIRECTOR RESEARCH

ASSOCIATE DIRECTOR EXTENSION

SUPERINTENDENT OF OSTAN STATION

RESEARCH PROGRAM

ANIMAL SCIENCE
- LIVESTOCK HUSBANDRY
  - Breeding
  - Nutrition
  - Management
- DAIRY HUSBANDRY
  - Breeding
  - Nutrition
  - Management
- POULTRY HUSBANDRY
  - Breeding
  - Nutrition
  - Management
- ANIMAL PATHOLOGY
  - Disease Control
  - Parasites
  - Sanitation

PLANT SCIENCE
- AGRONOMY
  - Field Crop Production
- HORTICULTURE
  - Production of:
    - Fruit
    - Nuts and Olives
    - Vegetables
- PLANT BREEDING
  - Improvement of:
    - Field Crops
    - Fruit Crops
    - Nut Crops
    - Vegetables
- FORESTRY
  - Control
  - Management
- PLANT PATHOLOGY
  - Diseases of:
    - Field Crops
    - Horticultural Crops
    - Forest Crops
- ENTOMOLOGY
  - Insects of:
    - Field Crops
    - Horticultural Crops
    - Forest Crops
- SOIL SCIENCE
  - Productivity
  - Conservation

AGRICULTURAL ENGINEERING
- FARM MACHINERY
  - Tractors
  - Tillage Implements
  - Planters
  - Seeders
  - Cultivators
  - Harvesters
- FARM STRUCTURES
  - Houses
  - Barns
  - Storage Buildings
  - Shops, etc.
- IRRIGATION
  - Structures
  - Water Use
  - Measuring
- DRAINAGE
  - Cropland
  - Swampland

AGRICULTURAL ECONOMICS
- FARM MANAGEMENT
  - Records
  - Farm Organization
  - Farm Operation
- MARKETING
  - Grain Crops
  - Fruit and Vegetables
  - Meat and Milk
  - Cooperatives
- LAND ECONOMICS
  - Land Use
  - Conservation
  - Taxation
- AGRICULTURAL PRICES AND STATISTICS
  - Prices
  - Statistics
- RURAL SOCIOLOGY
  - Rural Organizations
  - Recreation

EXTENSION PROGRAM OF SPECIALISTS

IN ANIMAL SCIENCE | IN PLANT SCIENCE | IN AGRICULTURAL ENGINEERING | IN AGRICULTURAL ECONOMICS

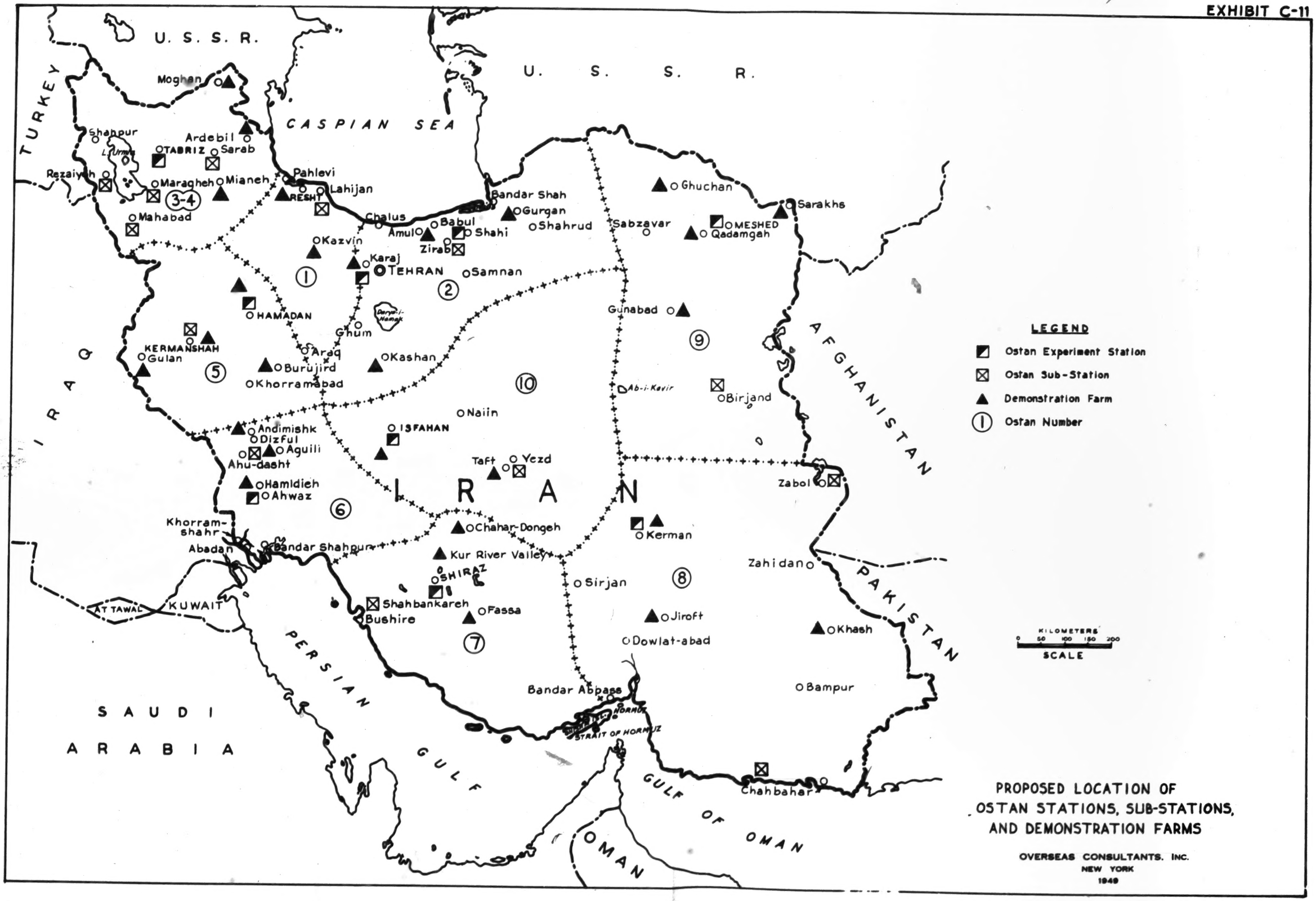
IN CHARGE OF
SUBJECT MATTER IN ABOVE FIELDS
FOR USE IN RURAL TEACHING
BY
SHAHRISTAN EXTENSION AGENTS
TRAINED TO HELP WITH
AGRICULTURAL PROBLEMS

PROPOSED ORGANIZATION FOR THE RESEARCH AND EXTENSION INSTITUTE

THE ORGANIZATION FROM SUPERINTENDENT OF OSTAN STATION DOWN WILL BE REPEATED IN EACH OSTAN STATION AND SUBSTATION, EXCEPT THAT THE SUBJECT MATTER SPECIALISTS WILL VARY ACCORDING TO THE PROBLEMS TO BE STUDIED IN EACH OSTAN.

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

EXHIBIT C-11



PROPOSED LOCATION OF OSTAN STATIONS, SUB-STATIONS, AND DEMONSTRATION FARMS

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

Exhibit C-12

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR AGRICULTURE

In Thousands of Rials

	Education Program	Projects for Ostans	Special Projects	Agricultural Credit	Total
1328—Second Half					
Domestic	3,750	18,450	23,190	30,000	75,390
Foreign Exchange	10,500	23,250	19,356	—	53,106
Total	14,250	41,700	42,546	30,000	128,496
1329					
Domestic	33,851	96,496	45,669	85,000	261,016
Foreign Exchange	22,153	126,243	81,914	—	230,310
Total	56,004	222,739	127,583	85,000	491,326
Remaining 5½ Years					
Domestic	25,777	810,337	358,068	414,881	1,609,063
Foreign Exchange	94,673	759,208	197,868	—	1,051,749
Total	120,450	1,569,545	555,936	414,881	2,660,812
Total					
Domestic	63,378	925,283	426,927	529,881	1,945,469
Foreign Exchange	127,326	908,701	299,138	—	1,335,165
Grand Total	190,704	1,833,984	726,065	529,881	3,280,634

U. S. S. R.

CASPIAN SEA

I R A N

IRAQ

AFGHANISTAN

PERSIAN GULF

GULF OF OMAN

ERIVAN (315)

LENKORAN

ASTARA

TABRIZ

CHEGHLIAR (185)

PAHLEVI

LAHIJAN

RAMSAR

ABNIRARAN

SABZEVAR

HARI RUD

DASHT - I - KAVIR

SAVEH

MALAYER

ARAK

ISFAHAN (110)

YEZD

KERMAN

ZABOL (145)

HIRMAND RIVER

SHELAG R.

ZAHEDAN (77)

BASRA KHORRAMSHAHR

FAO

GANAWEH (379)

BUSHIRE (278)

HENJAM

JASK

Scale:

0 50 100 150 200 250 300 KILOMETERS

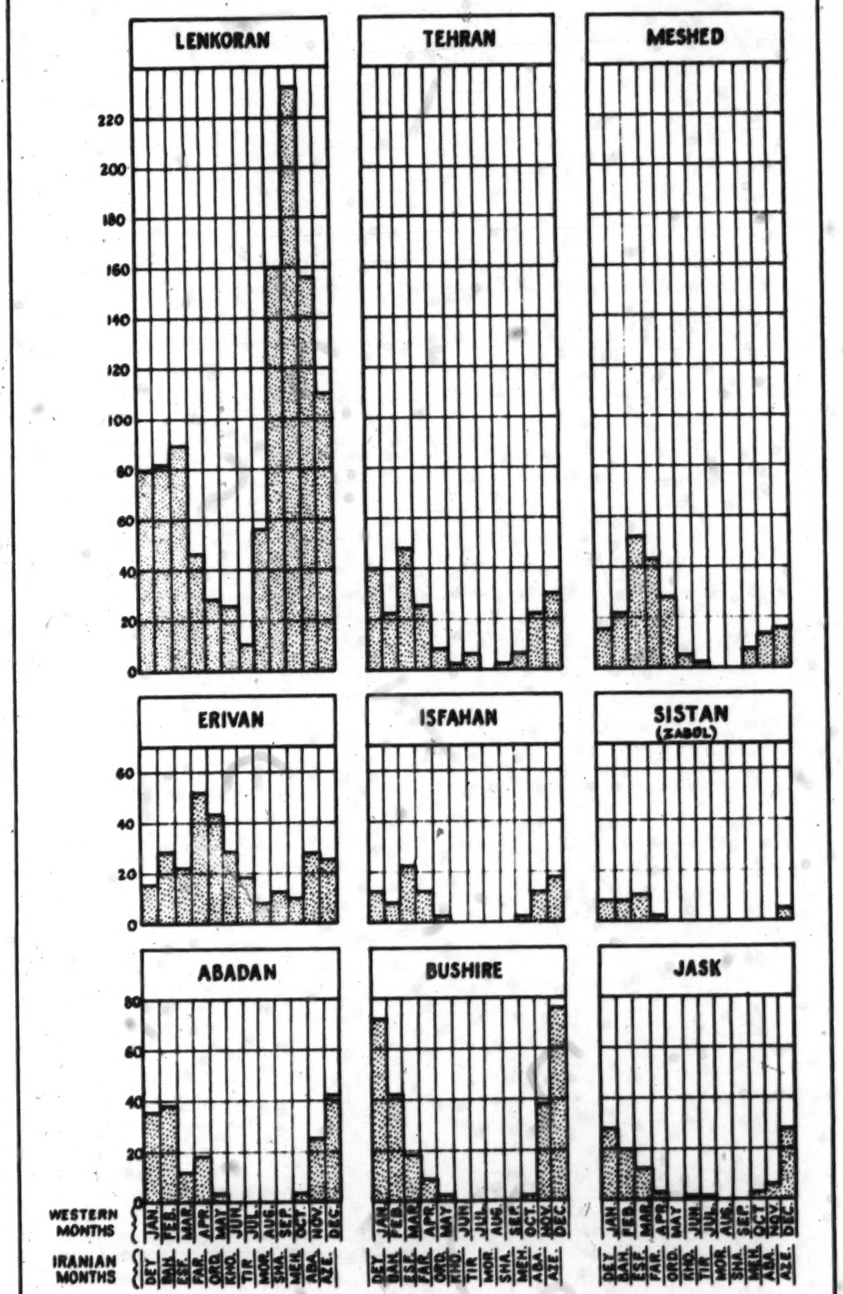
REFERENCE

- —250— Isohyetals figured in Millimeters
- (190) Long Average Recordings in Millimeters
- Boundaries of Catchment Areas.
- Existing Meteorological Stations used for Preparation of Isohyetals
- Water Exported.
- Water Imported.
- Areas from which Water is exported.

RIVERS, EXISTING METEOROLOGICAL
AVERAGE PRECIPITATION & CATCHMEN

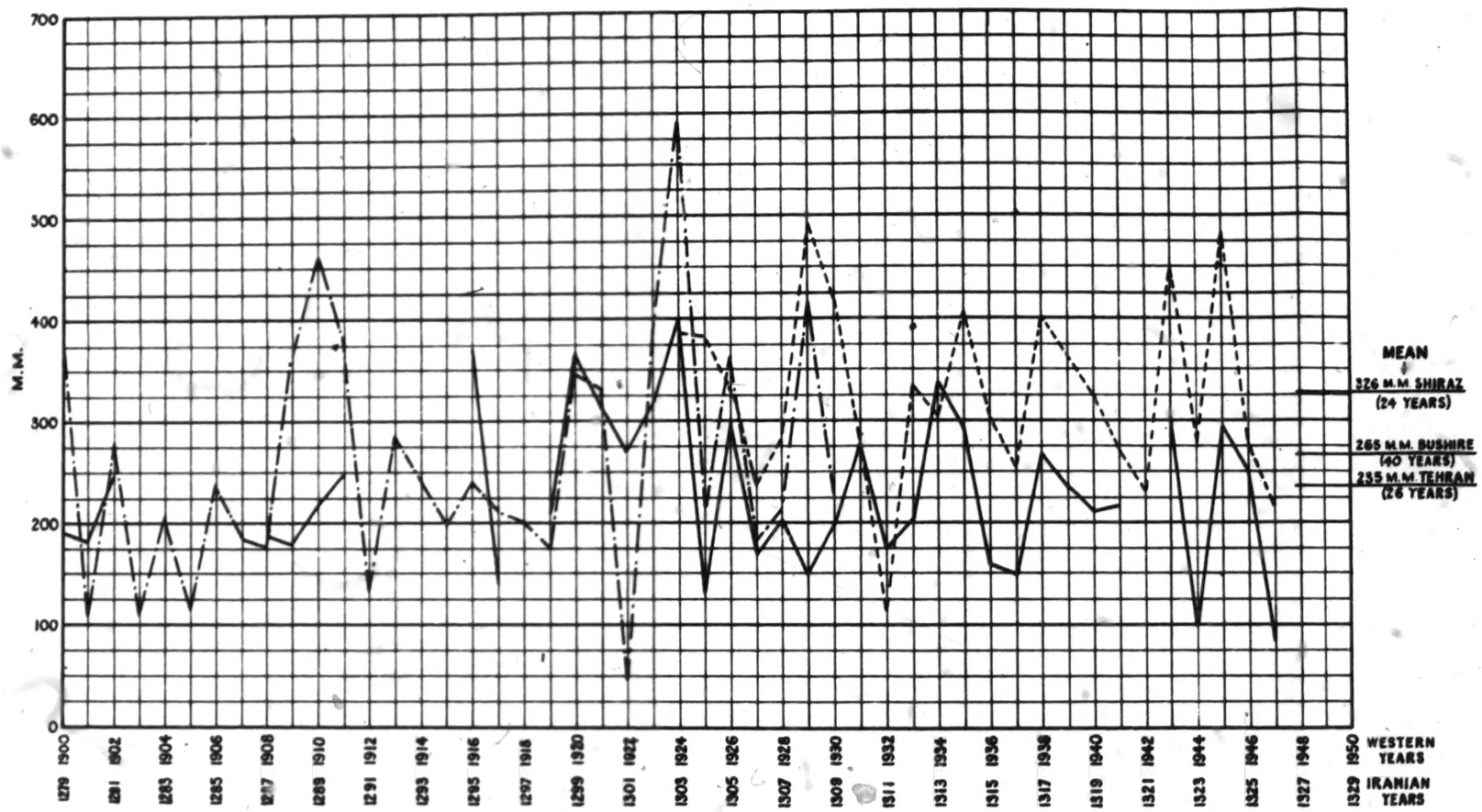
OVERSEAS CONSULTANTS, INC.

EXHIBIT D-2



MEAN MONTHLY RAINFALL FOR VARIOUS LOCALITIES IN AND NEAR IRAN

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949



SOURCES:-

TEHRAN : BRITISH CONSUL., TEHRAN
SHIRAZ : BRITISH CONSUL., SHIRAZ
BUSHIRE: BRITISH CONSUL., BUSHIRE

REFERENCE

TEHRAN .....
SHIRAZ .....
BUSHIRE .....

ANNUAL RAINFALL RECORDS FOR TEHRAN, SHIRAZ AND BUSHIRE

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

EXHIBIT D-4

RAINFALL DURATION CURVES

(TO BE READ IN CONJUNCTION WITH EX. D-3)

REFERENCE

TEHRAN.....———

SHIRAZ.....– – – –

BUSHIRE.....—·—·—

NOTE

TEHRAN 28 YEAR MEAN= 235 m/m

SHIRAZ 24 YEAR MEAN= 326 m/m

BUSHIRE 40 YEAR MEAN= 265 m/m

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

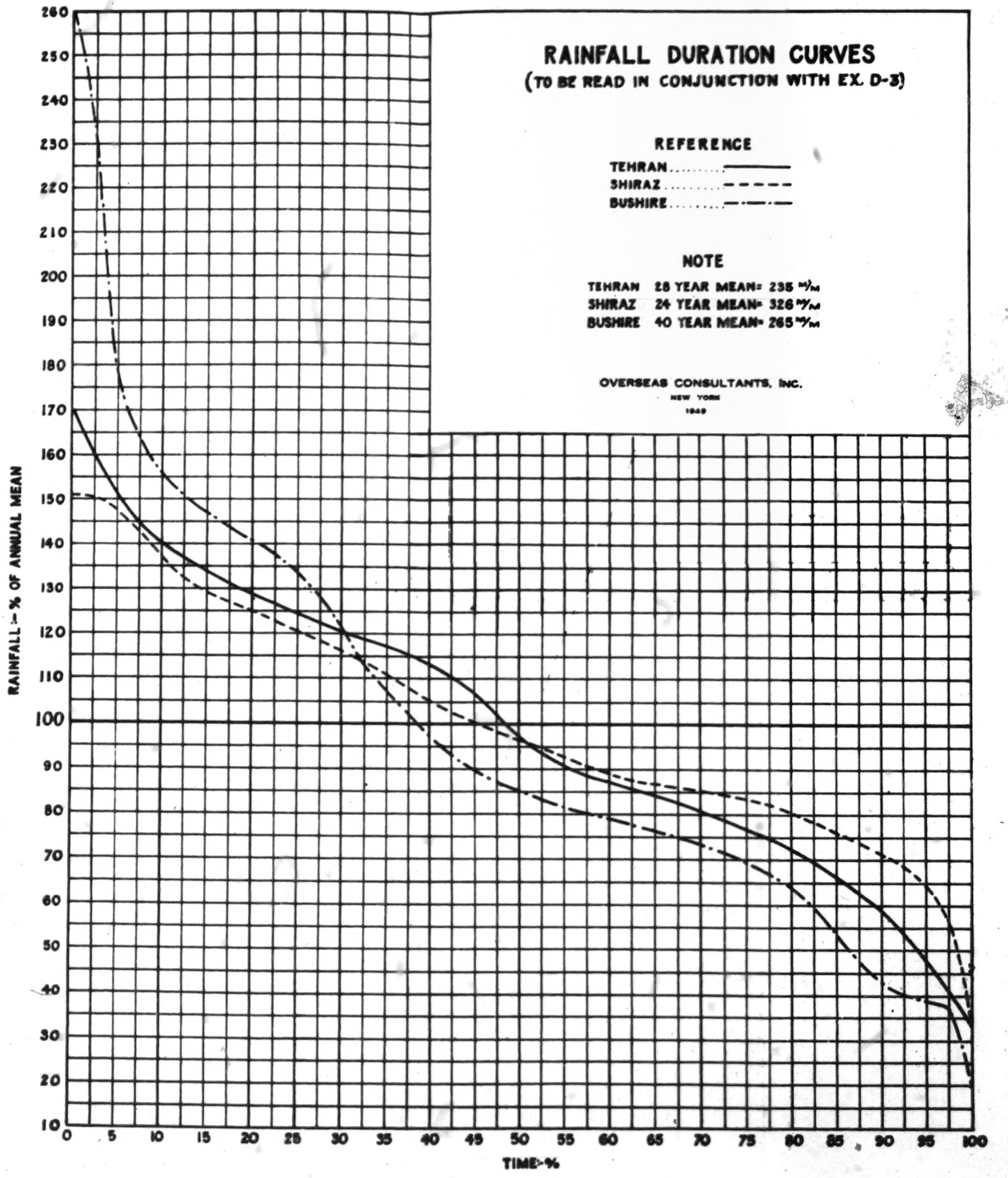
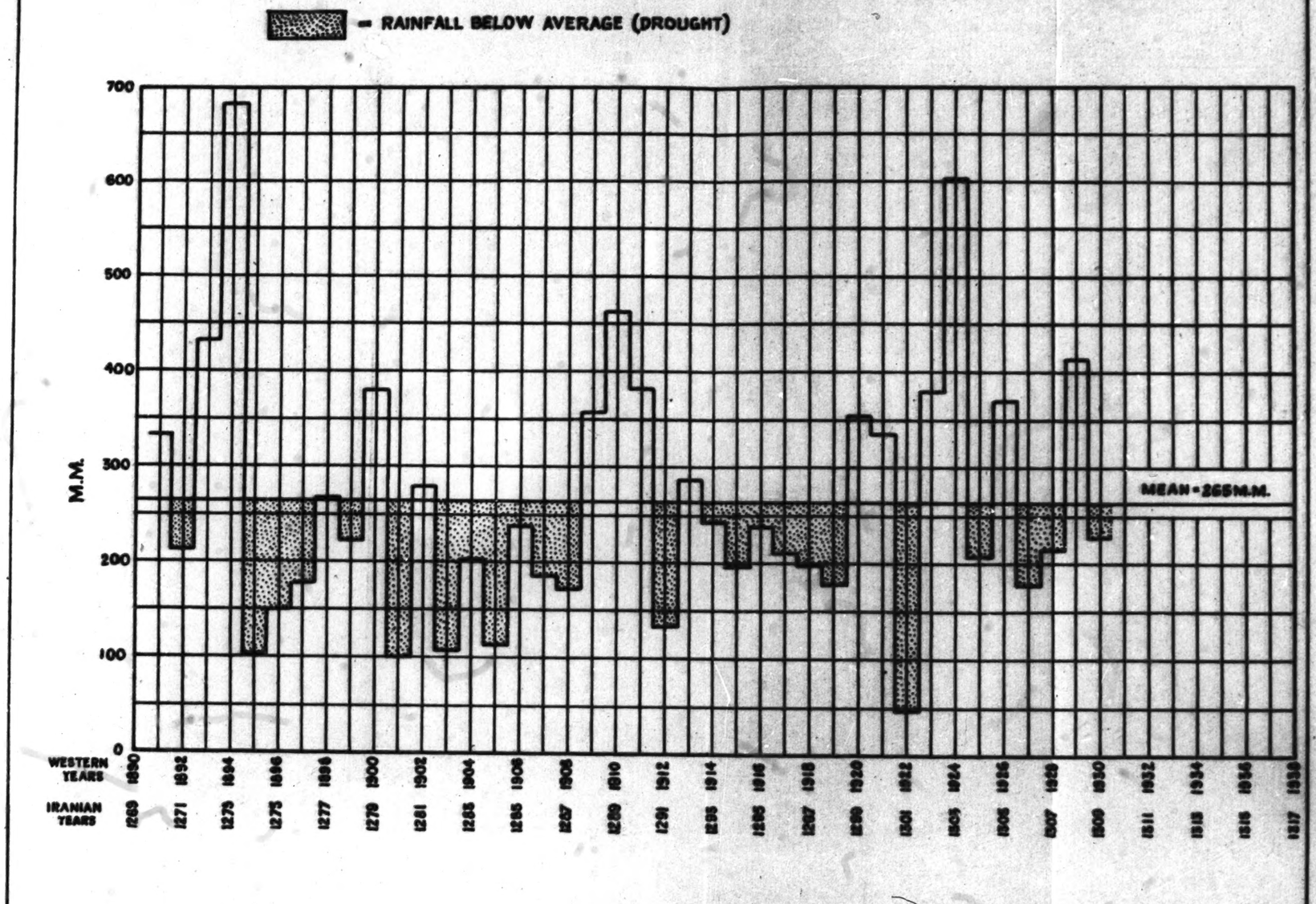


EXHIBIT D-5



BUSHIRE RAINFALL

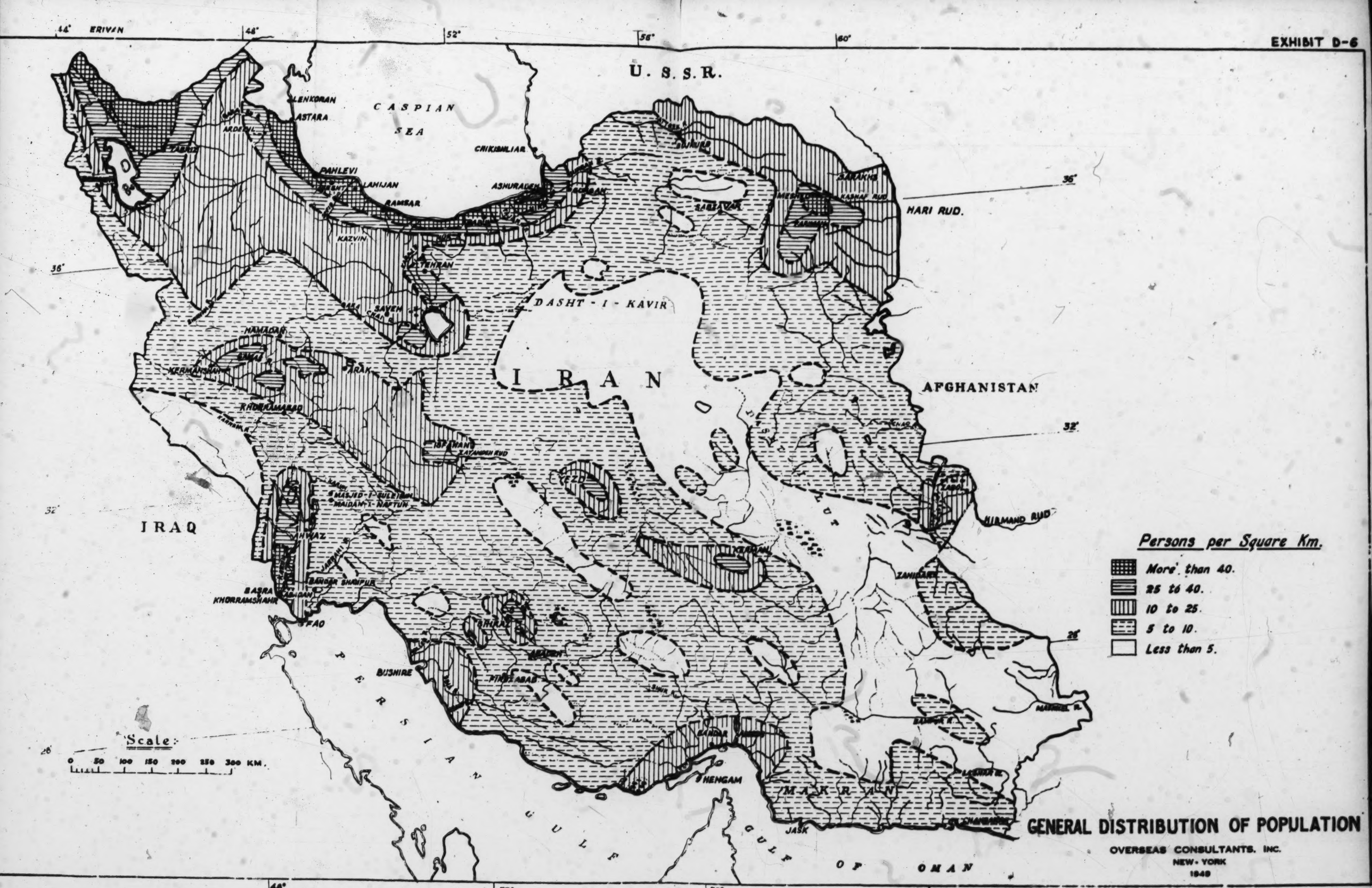
OVERSEAS CONSULTANTS, INC.

NEW YORK

1959

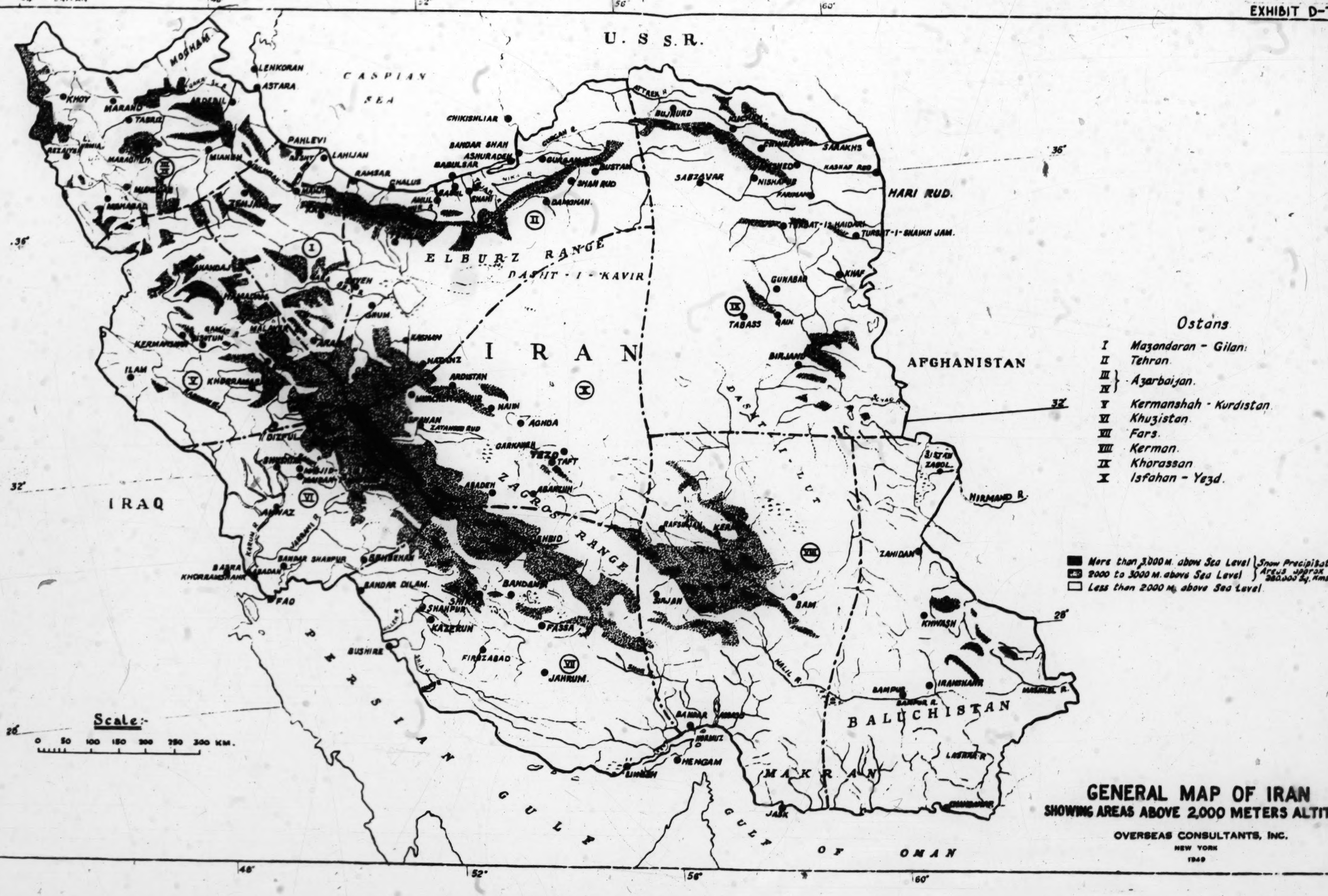
EXHIBIT D-6

GENERAL DISTRIBUTION OF POPULATION



OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

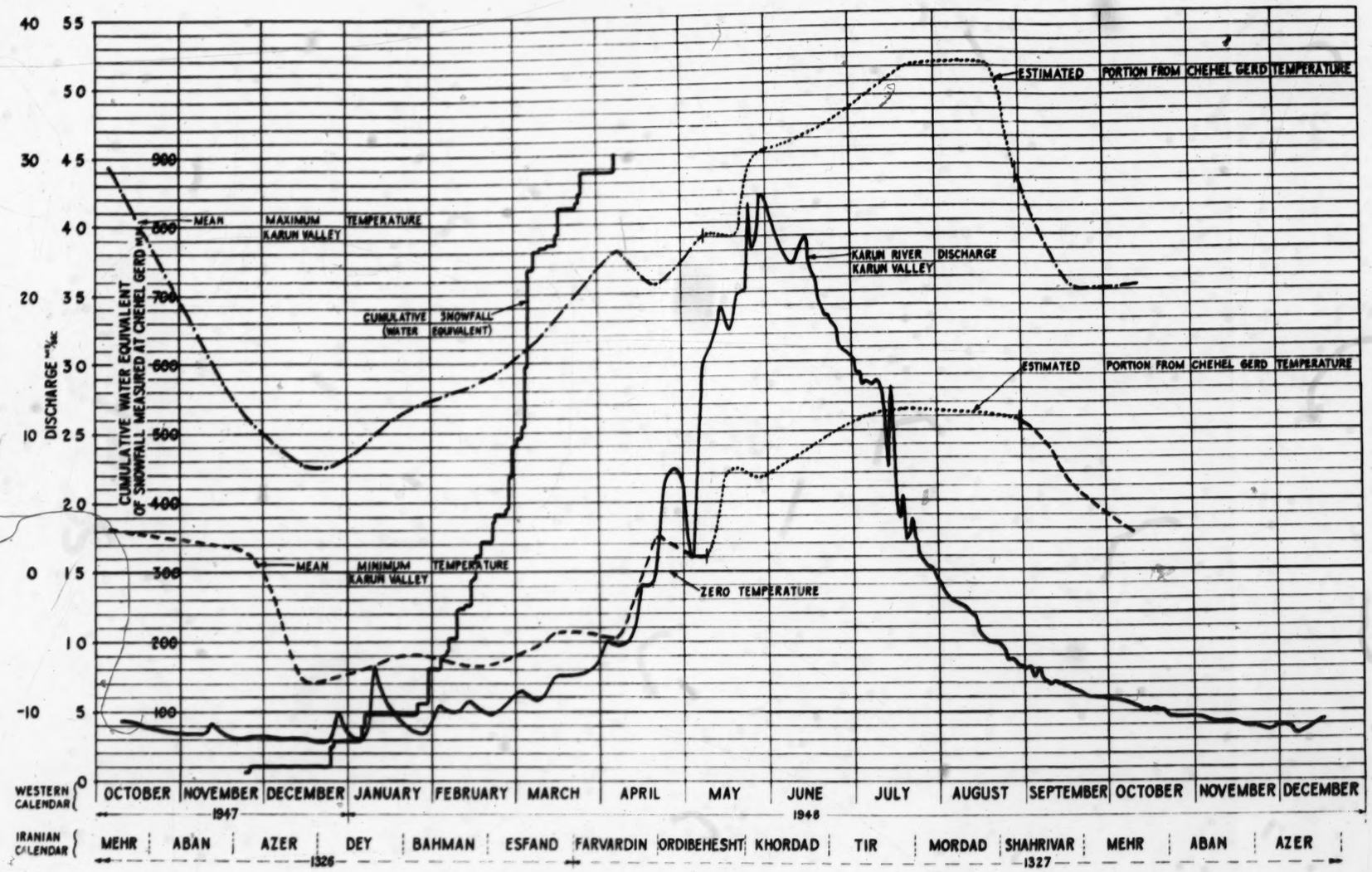
EXHIBIT D-7



GENERAL MAP OF IRAN
SHOWING AREAS ABOVE 2,000 METERS ALTITUDE

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

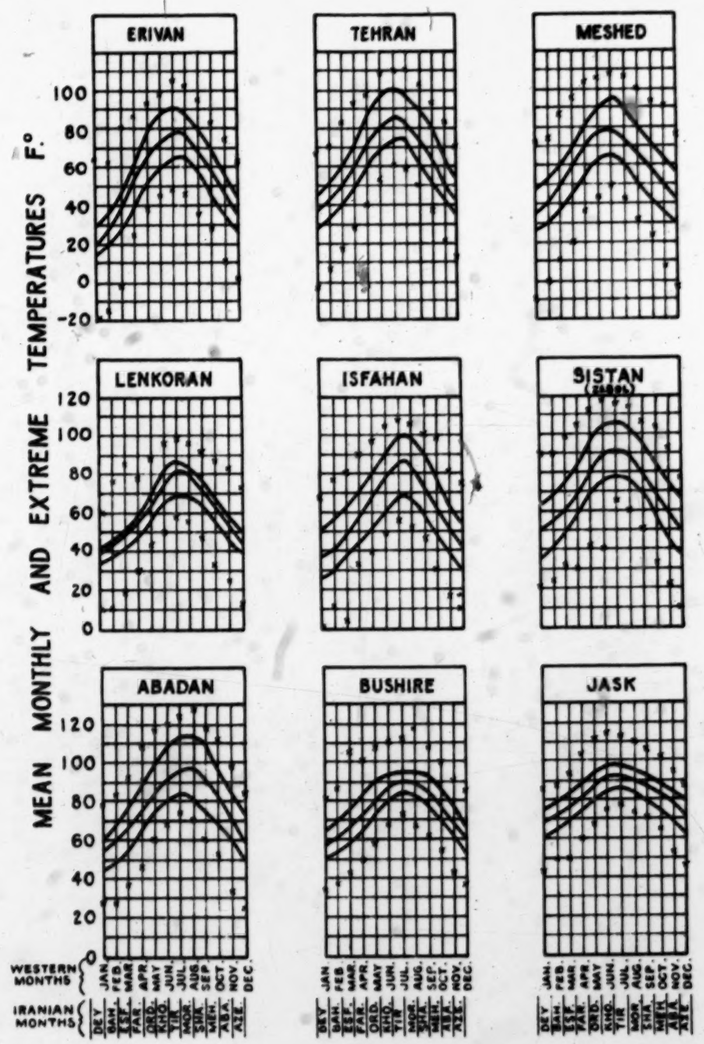
EXHIBIT D-8


TEMPERATURE CENTIGRADE
DISCHARGE M³/sec
CUMULATIVE WATER EQUIVALENT OF SNOWFALL MEASURED AT CHEHEL GERD M/M
MEAN MAXIMUM TEMPERATURE KARUN VALLEY
MEAN MINIMUM TEMPERATURE KARUN VALLEY
CUMULATIVE SNOWFALL (WATER EQUIVALENT)
KARUN RIVER DISCHARGE KARUN VALLEY
ESTIMATED PORTION FROM CHEHEL GERD TEMPERATURE
ESTIMATED PORTION FROM CHEHEL GERD TEMPERATURE
ZERO TEMPERATURE
WESTERN CALENDAR
OCTOBER NOVEMBER DECEMBER JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
1947
1948
IRANIAN CALENDAR
MEHR ABAN AZER DEY BAHMAN ESFAND FARVARDIN ORDIBEHESHT KHORDAD TIR MORDAD SHAHRIVAR MEHR ABAN AZER
1326
1327

RIVER DISCHARGE, TEMPERATURES AND SNOWFALL MEASUREMENTS AT KUHRANG DIVERSION TUNNEL SITE FOR SEASON 1326-27 (1947-48)

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

EXHIBIT D-9

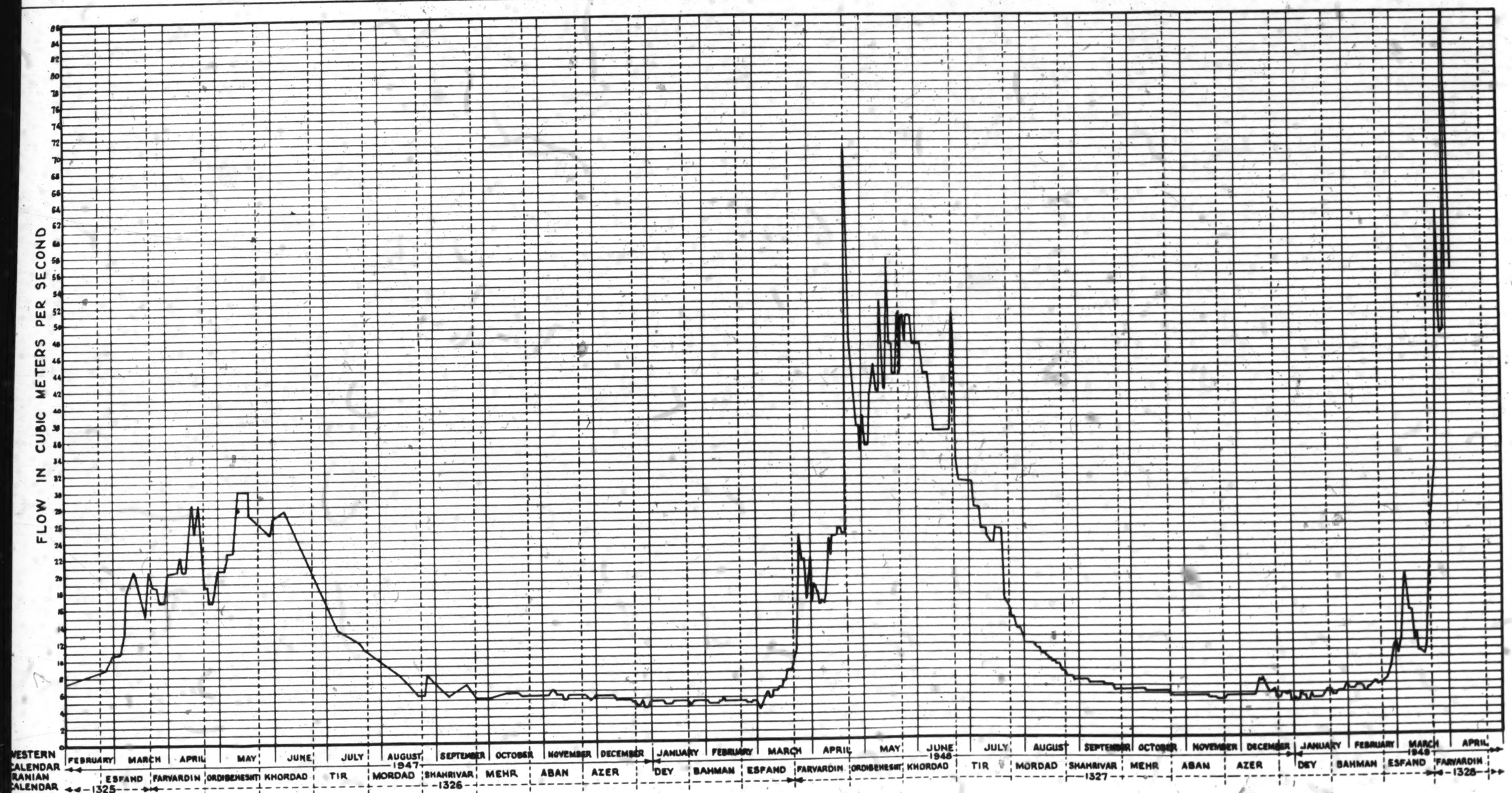


UPPER CROSSES - ABSOLUTE MAXIMUM
UPPER LINE — MEAN DAILY MAXIMUM
MIDDLE LINE — MEAN MONTHLY
LOWER LINE — MEAN DAILY MINIMUM
LOWER CROSSES - ABSOLUTE MINIMUM

MEAN MONTHLY TEMPERATURE RECORDS FOR VARIOUS LOCALITIES IN AND NEAR IRAN

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

EXHIBIT D-10



HYDROGRAPH OF THE KARAJ RIVER AT PILAGHAN (6 KM. ABOVE KARAJ) FOR THE PERIOD ESFAND 1325 TO FARVARDIN 1328 (FEBRUARY 1947 TO APRIL 1949)

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

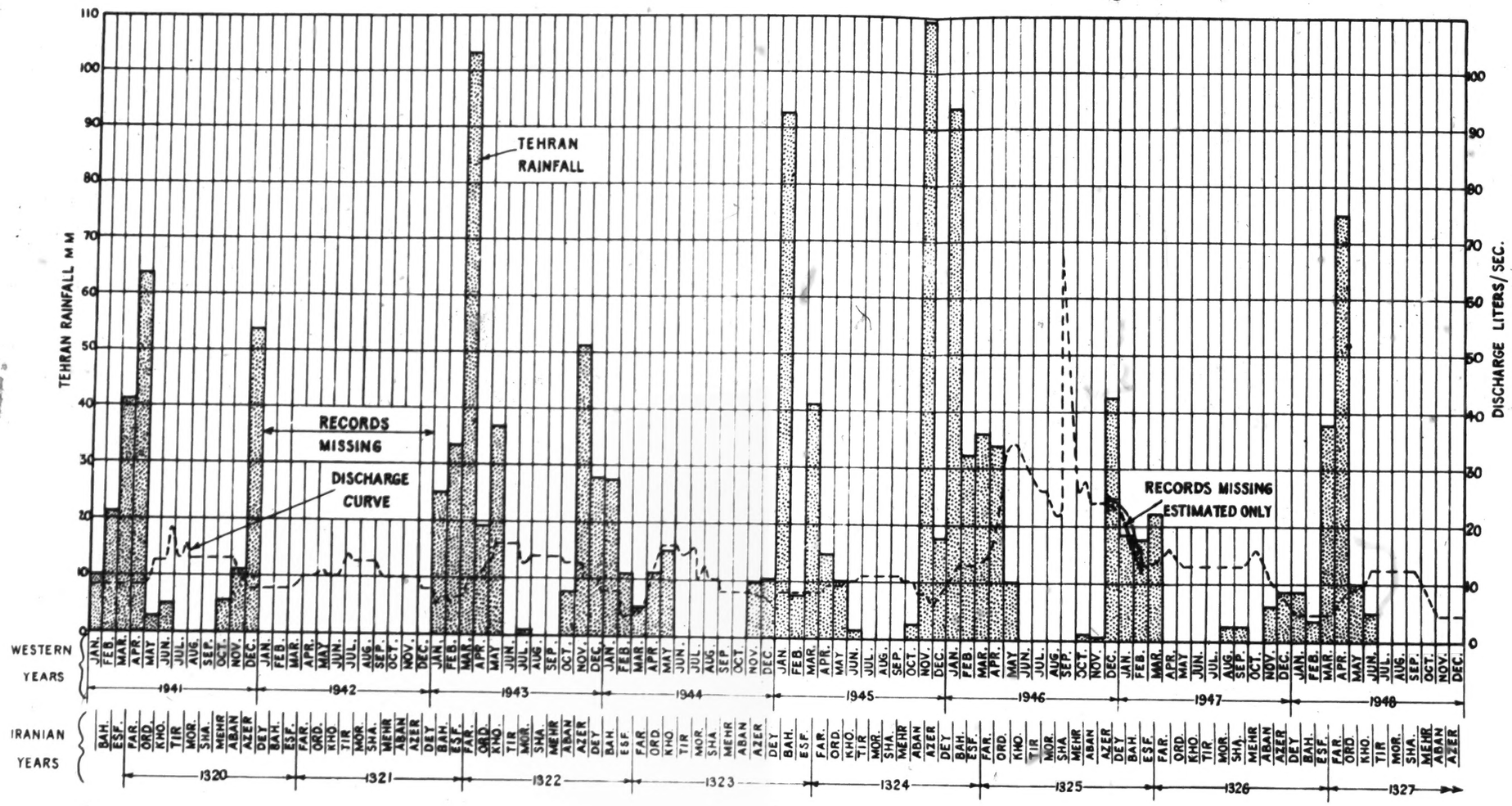
EXHIBIT D-11

	DATE	TEMPERATURE (°C.)	PH VALUE	ALKALINITY TO METHYL ORANGE ppm. $CaCO_3$	TOTAL HARDNESS ppm. $CaCO_3$	CALCIUM ppm. Ca	MAGNESIUM ppm. Mg	IRON ppm. Fe	MANGANESE ppm. Mn	SULPHATE ppm. SO_4	CHLORIDE ppm. Cl	NITRITE ppm. N	NITRATE ppm. N	DISSOLVED SILICA ppm. SiO_2	AMMONIA ppm. N	TOTAL DISSOLVED SOLIDS ppm. 180°C	SUSPENDED SOLIDS ppm.	TURBIDITY	COLOUR	ODOUR	TASTE
KARAJ RIVER																					
Spring		9	8·0	105	120	40	5	0·00	0·02	40	8	0·00	1·0	14	–	190	LOW TO HIGH	LOW TO HIGH	NIL	NIL	NIL
Summer		16	7·8	85	100	34	4	0·00	0·03	20	6	0·00	0·5	14	0·03	160	"	"	"	"	"
Autumn		18	8·0	110	130	42	6	0·00	0·04	35	8	0·00	0·4	14	–	200	"	"	"	"	"
Winter		8	8·1	120	160	55	6	0·00	0·02	45	11	0·00	0·5	14	–	230	LOW	LOW	"	"	"
TEHRAN																					
American Embassy West Borehole	12-3-47	19		152	98	27	7	–	–	66	23	–	–	–	–	325	5	HIGH	–	NIL	–
American Embassy East Borehole	10-5-47	18		196	50	16	–	–	0·02	86	32	–	–	–	–	–	–	"	–	"	–
British Embassy Kanat	11-5-47	17		177	120	37	7	–	0·00	31	18	–	–	–	–	312	–	"	NIL	"	–
Shah Kanat	11-5-47	14		120	103	37	–	–	–	11	4	–	–	–	–	–	4	ALMOST NIL	"	"	–
AREA NTH OF TEHRAN																					
Kanat Surfacing near Chalbarz	3-1-48	13	7·9	234	274	70	14	0·00	–	70	39	0·00	–	24	–	481	38	NIL	NIL	NIL	NIL
Junction of Kanats near Gulhek	3-1-48	12	8·0	158	140	48	10	0·02	–	45	18	0·00	–	24	–	312	24	"	"	"	"
Main Kanat, Wanak	3-1-48	14	8·0	206	190	62	10	0·00	–	17	43	–	–	20	–	284	11	"	"	"	"
Straker Bore, Gulhek	3-1-48	16	7·7	305	430	134	21	0·00	–	111	43	0·02	–	20	–	665	20	"	"	"	"
MESHED																					
Chashmeh Gilas A,B,D			7·2	224	525	99	67	–	–	520	182	0·00	–	30	–	1378	–	–	–	–	–
Chashmeh Gilas C			7·1	215	455	83	52	–	–	450	158	0·00	–	35	–	1228	–	–	–	–	–
Mir Kariz: Trial Bore			7·5	208	320	89	25	–	–	177	80	0·12	–	16	–	640	–	–	–	–	–
Gunabad Jube at Kuh-i-Sangi			7·7	163	176	50	11	–	–	71	8	0·00	–	16	–	332	–	–	–	–	–
ISFAHAN																					
Well "A"			7·6	312	439	–	33	0·01	0·00	135	136	0·003	1·4	16	1·2	845	11	NIL	NIL	NIL	NIL
SHIRAZ																					
Trial Bore			7·3	380	490	–	50	0·02	0·05	105	31	0·009	–	19	–	690	28	VERY SLIGHT	NIL	NIL	–
NEAR KUHRANG SITE																					
Karun River			7·8	138	140	52	1	–	–	6	2	–	–	6	–	154	20	–	–	–	–
Kuhrang River			7·8	141	145	54	2	–	–	10	3	–	–	8	–	150	8	–	–	–	–
Sheikh Ali Khan River			7·6	130	130	46	1	–	–	6	–	–	–	6	–	200	16	–	–	–	–

TABLE OF CHEMICAL ANALYSES OF SAMPLES OF WATER FROM VARIOUS SOURCES IN IRAN.

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

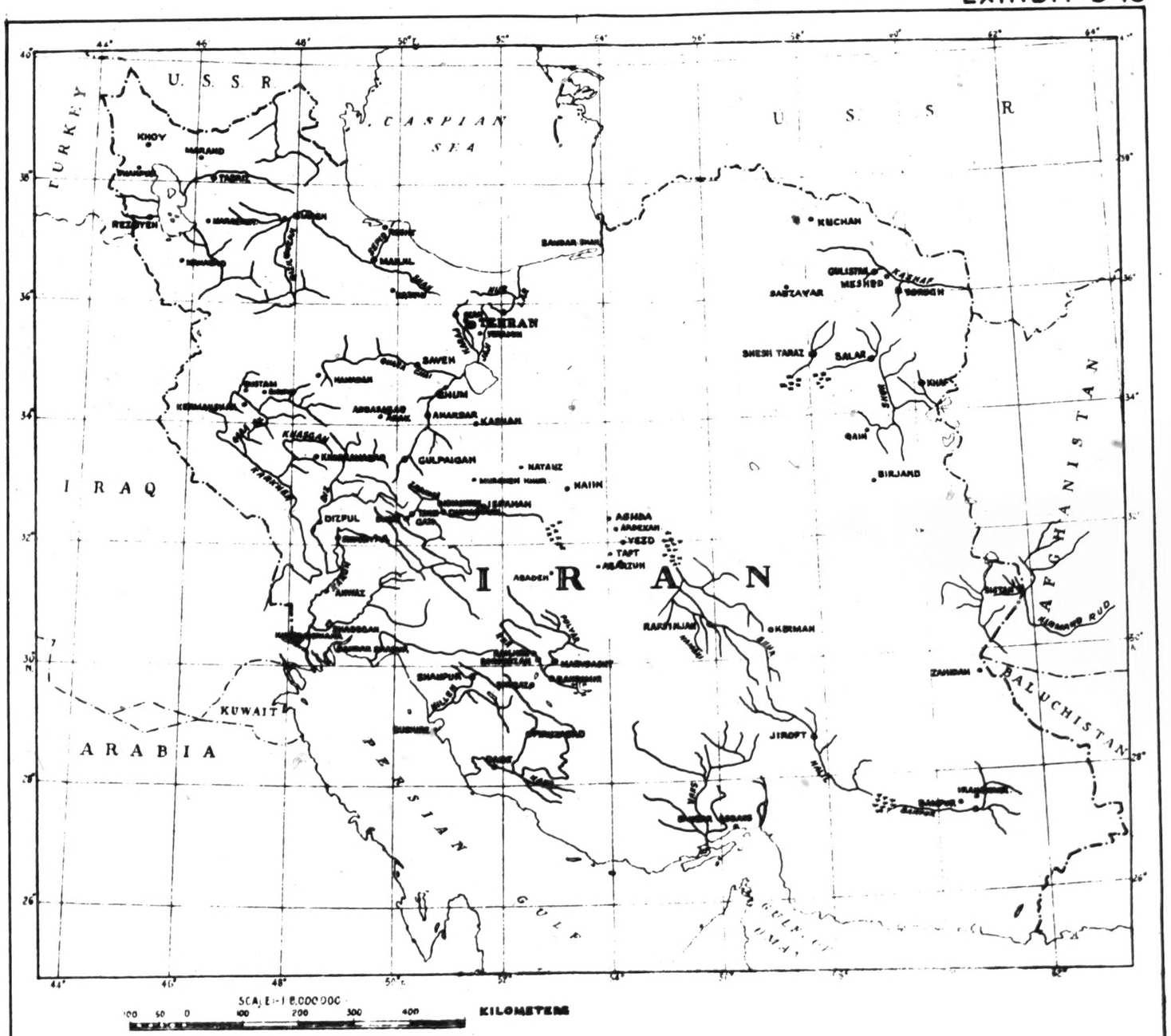
EXHIBIT D-12



HYDROGRAPH FOR BRITISH EMBASSY KANAT, TEHRAN, COMPARED WITH TEHRAN MONTHLY RAINFALL FOR THE SAME PERIOD

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

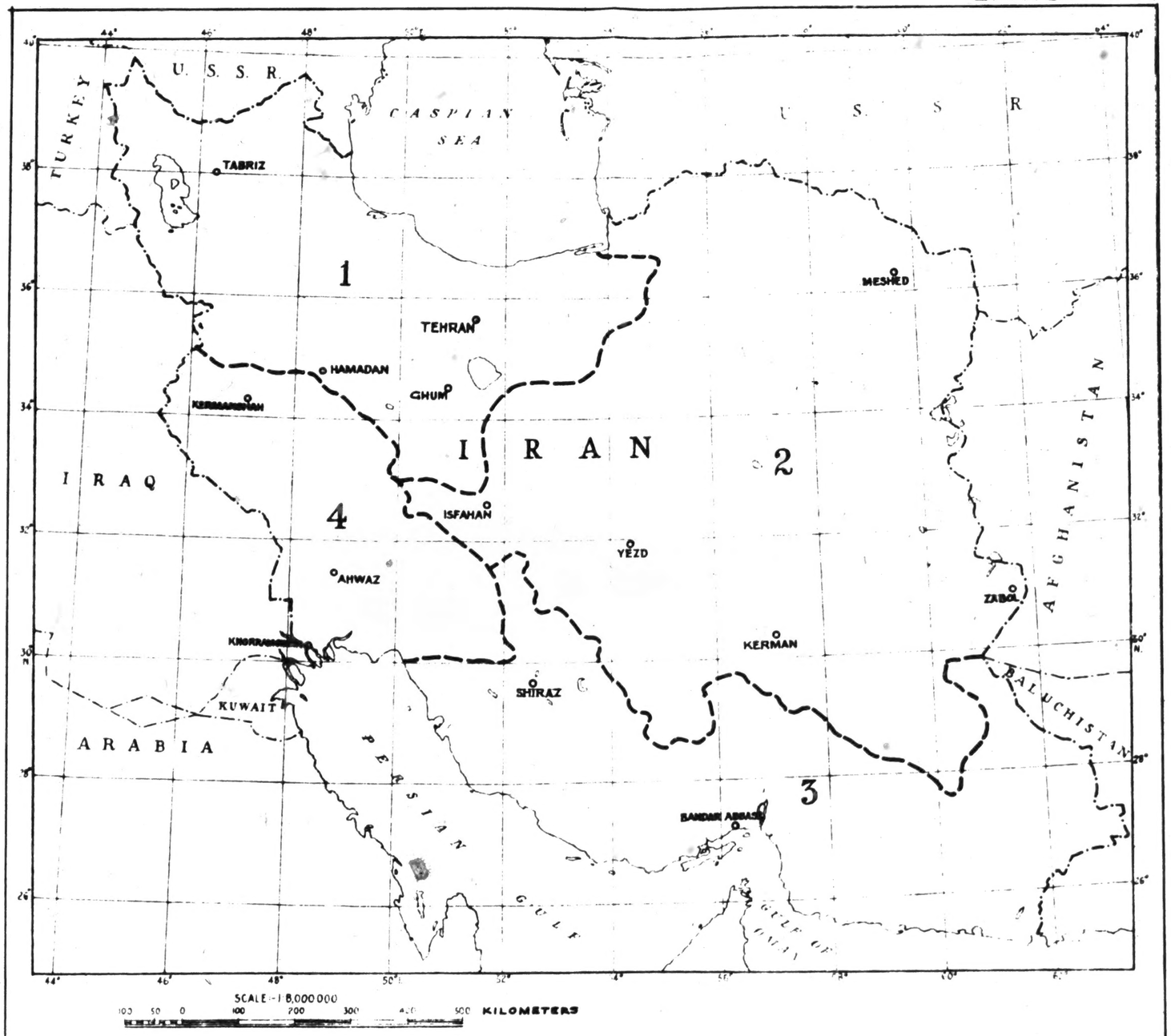
EXHIBIT D-13



CIVIL ENGINEERING PROJECTS VISITED BY MEMBERS OF THE STAFF OF OVERSEAS CONSULTANTS, INC.

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

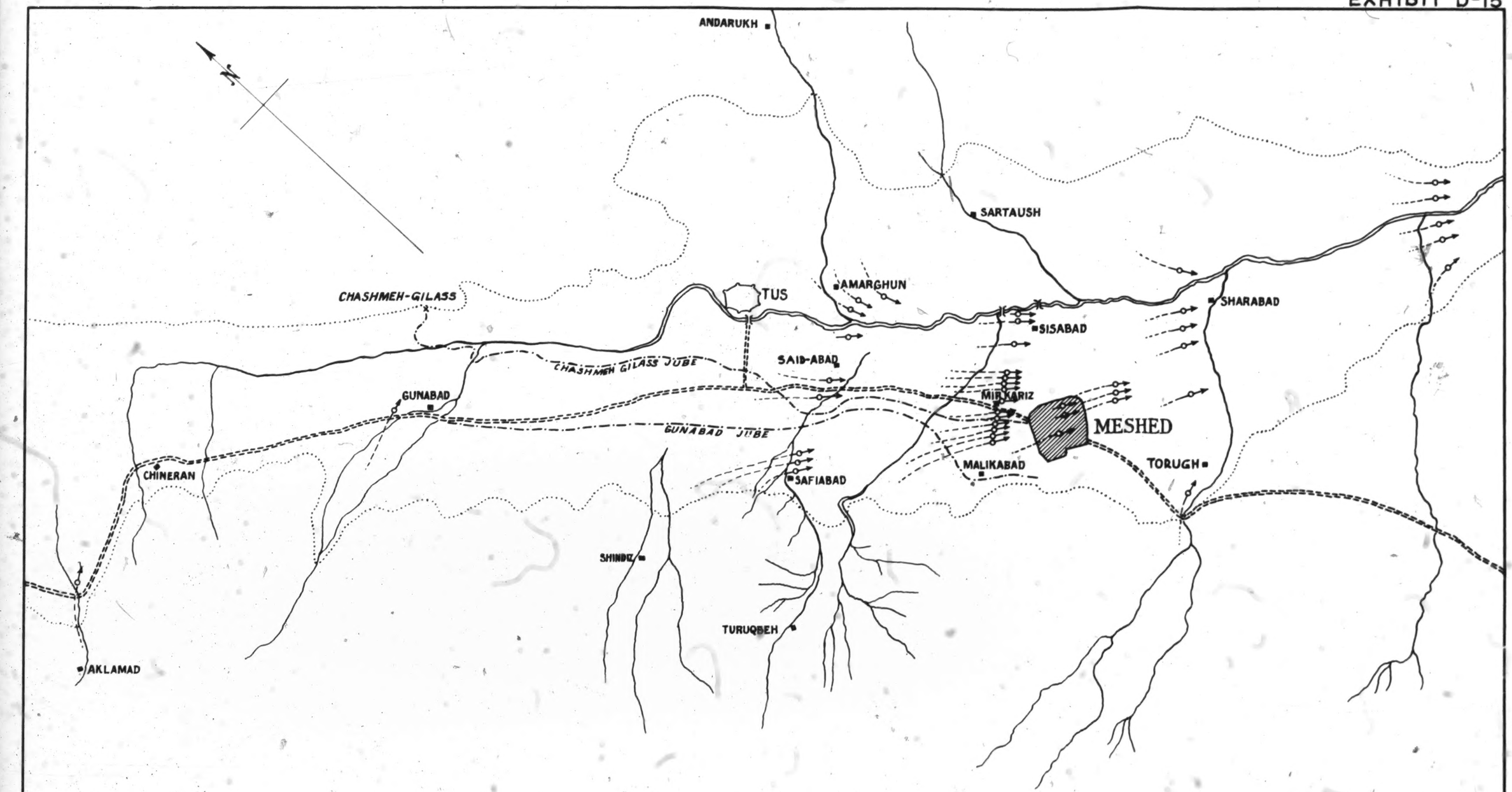
EXHIBIT D-14



SUGGESTED BOUNDARIES OF WATER DISTRICTS UNDER CENTRAL AUTHORITY

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

EXHIBIT D-15



REFERENCE

JUBES

SITES FOR WELLS AND DIRECTION OF FLOW

APPROXIMATE EDGE OF VALLEY FLOOR

SCALE OF KILOMETERS

5 0 5 10 15 20 25

MESHED VALLEY
SHOWING SUGGESTED DEVELOPMENT OF UNDERGROUND WATER RESOURCES

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

SILTING OF AKLAMAD DAM

General view of downstream face of dam, looking north.

Silted storage area and erosion. Flood water now passes by channel on south (right) bank and along upstream face of dam.

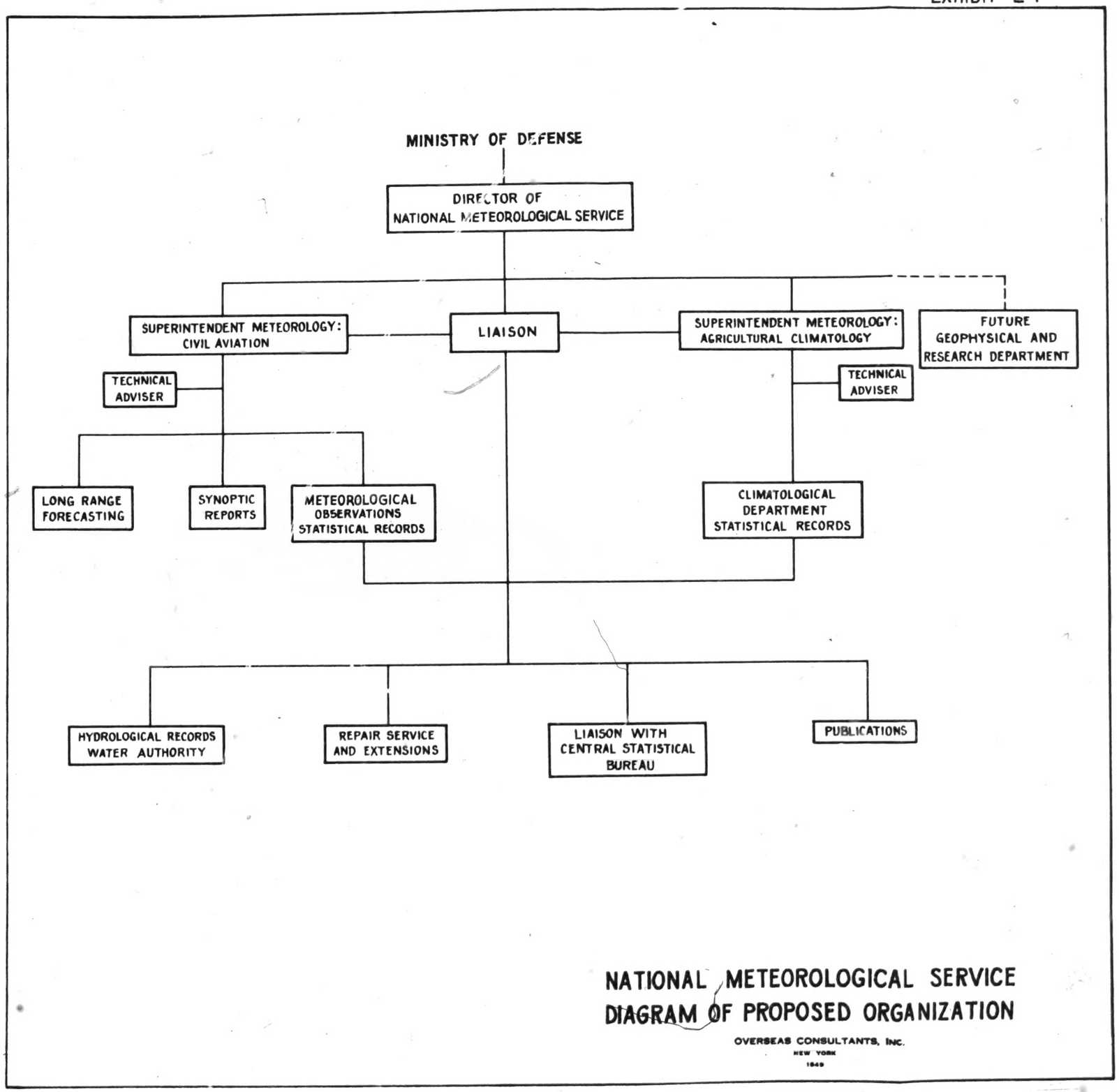
Northern discharge tower in upstream face, showing original height of dam. Silt surface in impounding area is now one meter above upper open round hole.

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR WATER RESOURCES

In Thousands of Rials

	1328—Second Half			1329			Remaining 5½ Years			Total		
	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total
Central Water Authority	10,500	4,000	14,500	12,000	6,000	18,000	102,000	25,500	127,500	124,500	35,500	160,000
Survey of Water Resources	7,000	4,000	11,000	8,000	5,000	13,000	56,500	39,500	96,000	71,500	48,500	120,000
Development of Underground Resources:												
Kanats	3,000	1,000	4,000	3,500	1,500	5,000	26,000	5,000	31,000	32,500	7,500	40,000
Buried Cut-offs	1,500	500	2,000	4,000	1,000	5,000	9,000	4,000	13,000	14,500	5,500	20,000
Pumped Boreholes	32,500	55,500	88,000	10,500	22,500	33,000	41,000	124,000	165,000	84,000	202,000	286,000
Construction of Reservoirs, Canals, etc.	26,500	4,000	30,500	16,000	13,000	29,000	885,500	279,000	1,164,500	928,000	296,000	1,224,000
Total	81,000	69,000	150,000	54,000	49,000	103,000	1,120,000	477,000	1,597,000	1,255,000	595,000	1,850,000

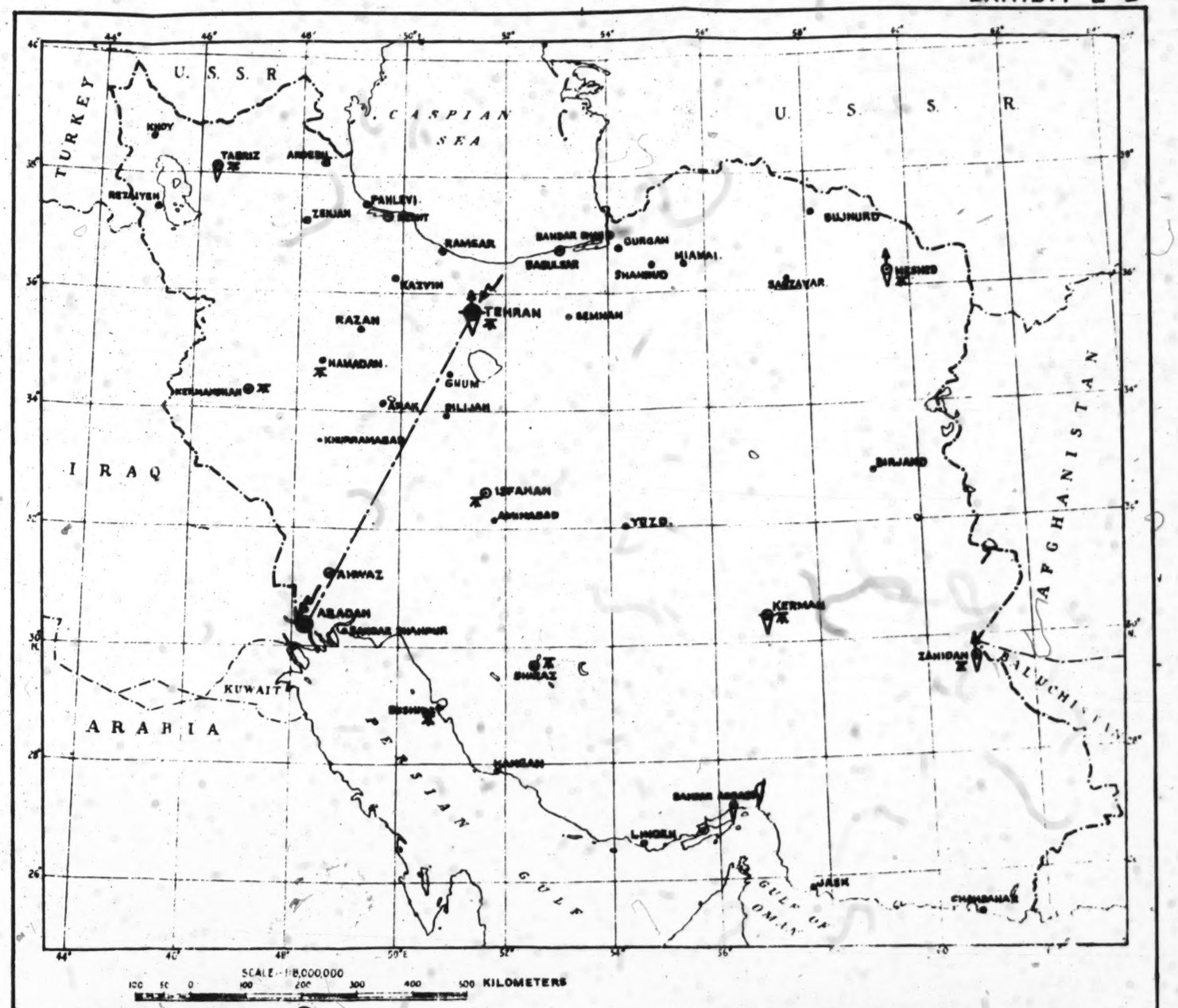
EXHIBIT E-1



NATIONAL METEOROLOGICAL SERVICE
DIAGRAM OF PROPOSED ORGANIZATION

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

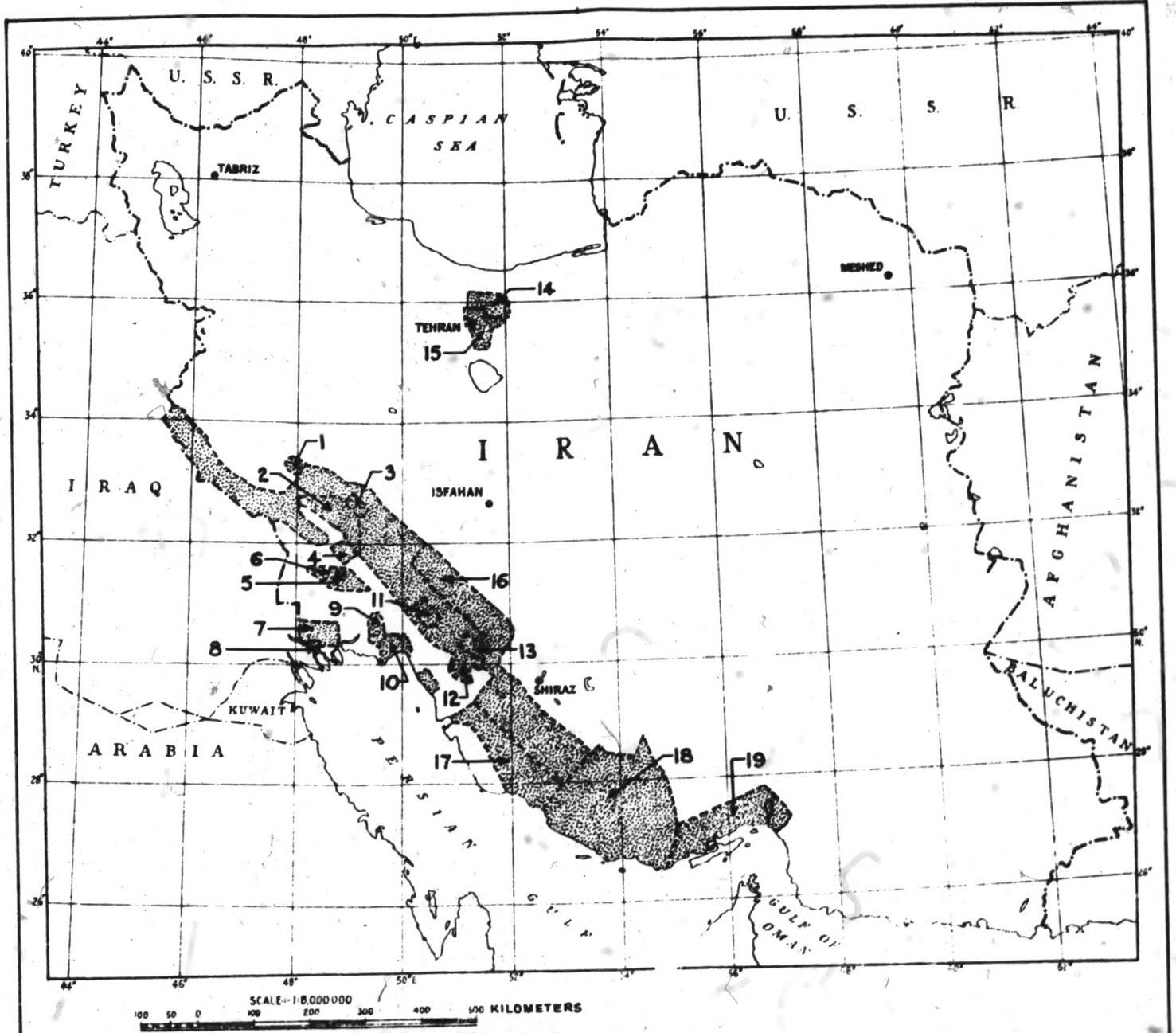
EXHIBIT E-2



NATIONAL METEOROLOGICAL SERVICE
RECOMMENDED NETWORK OF
FORECASTING AND SYNOPTIC STATIONS

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

EXHIBIT F-1

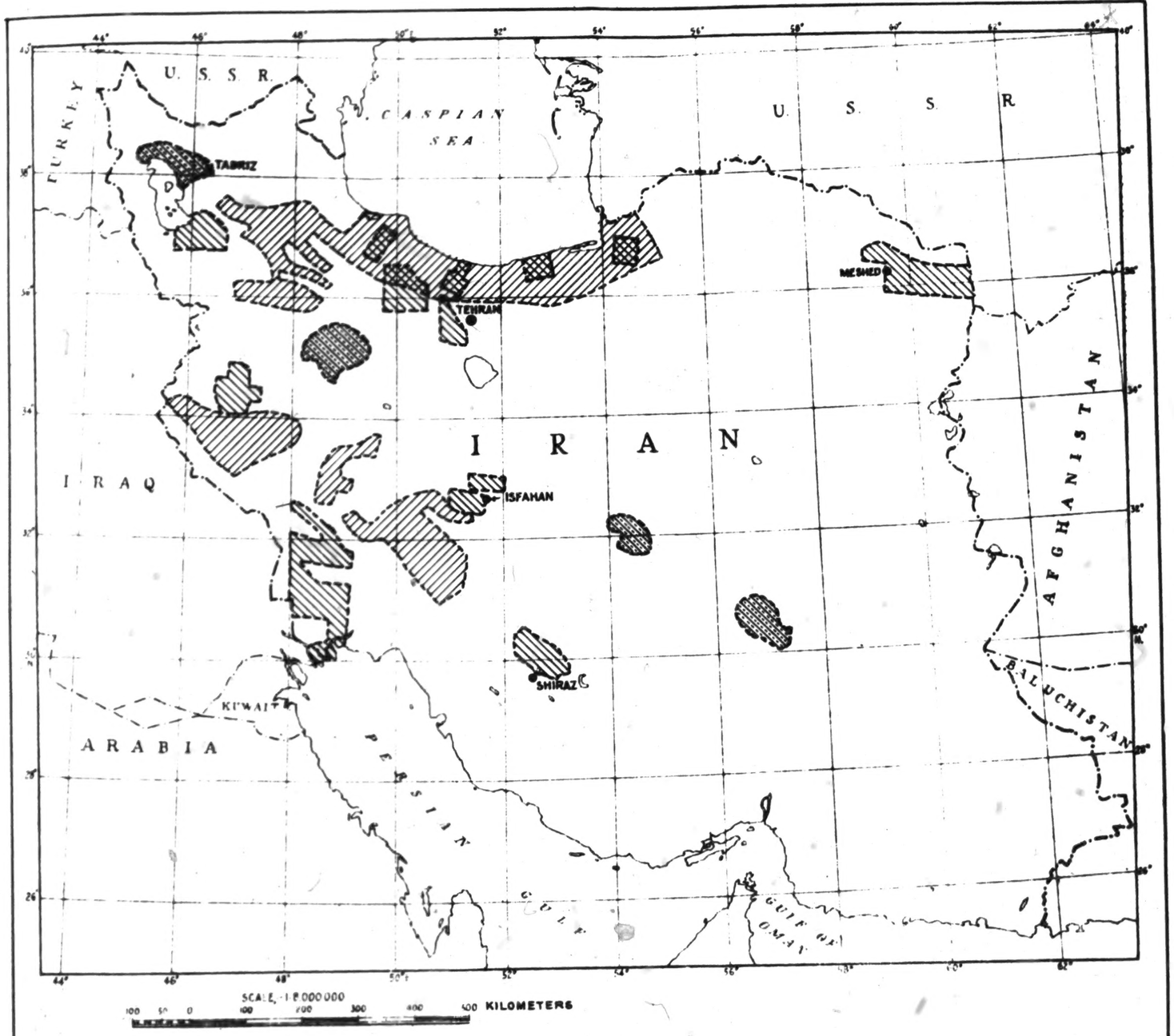


1 {PROPOSED MOSAIC, 1:30,000 / EXISTING PROPOSAL, 1:21,120} CONTOURED
2 EXISTING PROPOSAL, 1:21,120 } CONTOURED
3 EXISTING, 1:21,120 (LALI)
4 EXISTING PROPOSAL, 1:21,120 OR 1:50,000
5 EXISTING 1:1,500 (AHWAZ)
6 EXISTING PROPOSAL, 1:21,120 OR 1:50,000
7 EXISTING PROPOSAL, 1:21,120 OR 1:50,000
8 EXISTING, 1:24,000 (ABADAN)
9 EXISTING, 1:10,000 AND 1:20,000 (MASHUR)
10 EXISTING PROPOSAL, 1:21,120 OR 1:50,000
11 EXISTING, 1:21,120 (AGHA JARI)
12 EXISTING PROPOSAL, 1:21,120
13 EXISTING, 1:10,560 (GACH SARAN)
14 EXISTING, 1:25,000, 50 m. CONTOURING } TEHRAN
15 EXISTING, 1:10,000, 10 m. CONTOURING } TEHRAN
16, 17, 18, 19 PROPOSED MOSAIC, 1:40,000

EXISTING AIR SURVEYS AND EXISTING PROPOSALS

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

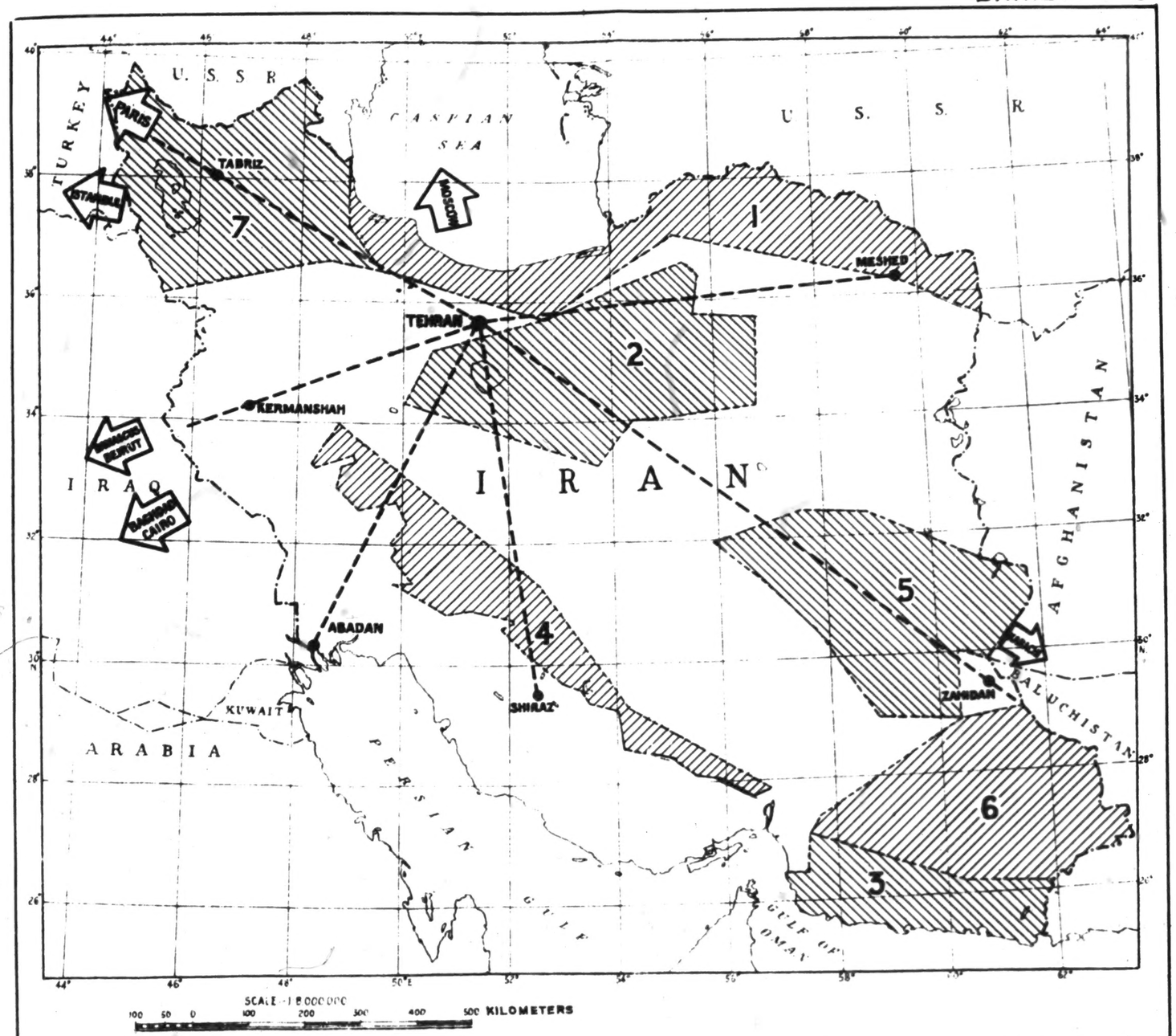
EXHIBIT F-2



RECOMMENDATIONS FOR 1:50,000 AND 1:10,000 AIR SURVEYS

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

EXHIBIT F-3



-AREAS TO BE PHOTOGRAPHED AND MAPPED FOR PURPOSES OF GEOLOGICAL EXPLORATION

ORDER OF PRIORITIES

I.	AREA 5	= 117,000 km²
II.	AREAS 3 AND 6	= 170,000 km²
III.	AREAS 2 AND 4	= 199,000 km²
IV.	AREAS 1 AND 7	= 223,000 km²

NOTE:-
1:250,000 SCALE MAPS TO BE IN ACCORDANCE WITH ICAO REGULATIONS FOR USE IN CIVIL AVIATION. ADDITIONAL AREAS TO BE MAPPED TO THE SAME SCALE BY REVISION OF THE EXISTING INDIAN AIR SURVEY

EXTERNAL AND INTERNAL AIR ROUTES WITH AREAS TO BE PHOTOGRAPHED AND SUBSEQUENTLY MAPPED TO A SCALE OF 1:250,000 FOR GEOLOGICAL EXPLORATION

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

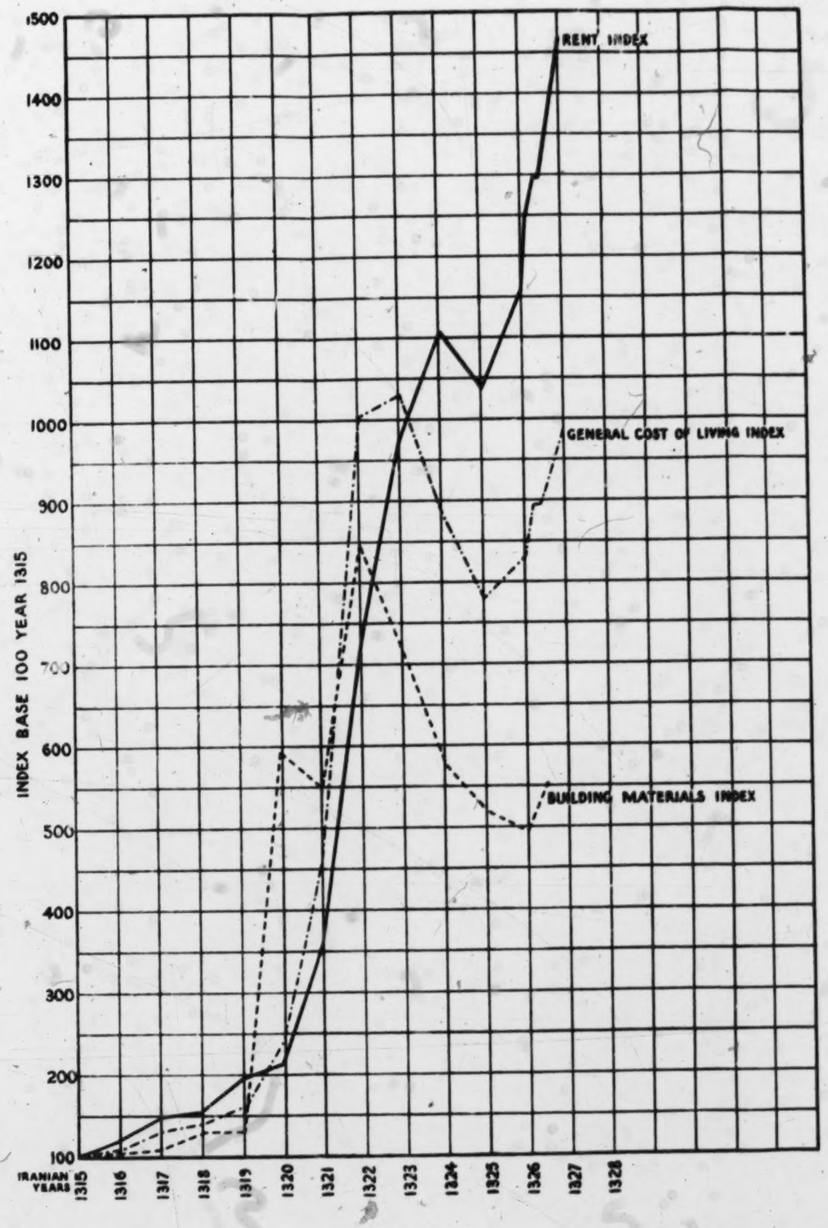
Exhibit G-1

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR TOWN IMPROVEMENT AND HOUSING

In Thousands of Rials

	1328 Second Half	1329	Remaining 5½ Years	Total
Town Improvement				
Central Town Planning Bureau	7,500	15,000	92,500	115,000
Loans for Redevelopment	—	—	160,000	160,000
Civic Buildings and Public Works	—	—	125,000	125,000
Road Works	—	10,000	90,000	100,000
Total	7,500	25,000	467,500	500,000
Low Cost Housing				
Central Housing Authority	5,000	15,000	15,000	35,000
Building Loan Society	—	100,000	600,000	700,000
Slum Clearance Schemes	—	10,000	290,000	300,000
Subsidies for Housing Schemes	—	10,000	290,000	300,000
Loans to Industrial Bank	—	50,000	50,000	100,000
Miscellaneous Grants	5,000	10,000	50,000	65,000
Total	10,000	195,000	1,295,000	1,500,000
Potable Water Supplies	10,000	30,000	710,000	750,000
Grand Total	27,500	250,000	2,472,500	2,750,000
Foreign Currency Requirements				
Town Improvement	—	3,000	32,000	35,000
Low Cost Housing	700	14,500	94,800	110,000
Potable Water Supplies	5,000	25,000	500,000	530,000
Total	5,700	42,500	626,800	675,000

EXHIBIT G-2



RENT IN RELATION TO THE COST OF LIVING AND THE COST OF BUILDING MATERIALS
(BASE YEAR 1315 = 100)

BASED ON FIGURES PUBLISHED BY THE BANK MELLI IRAN.

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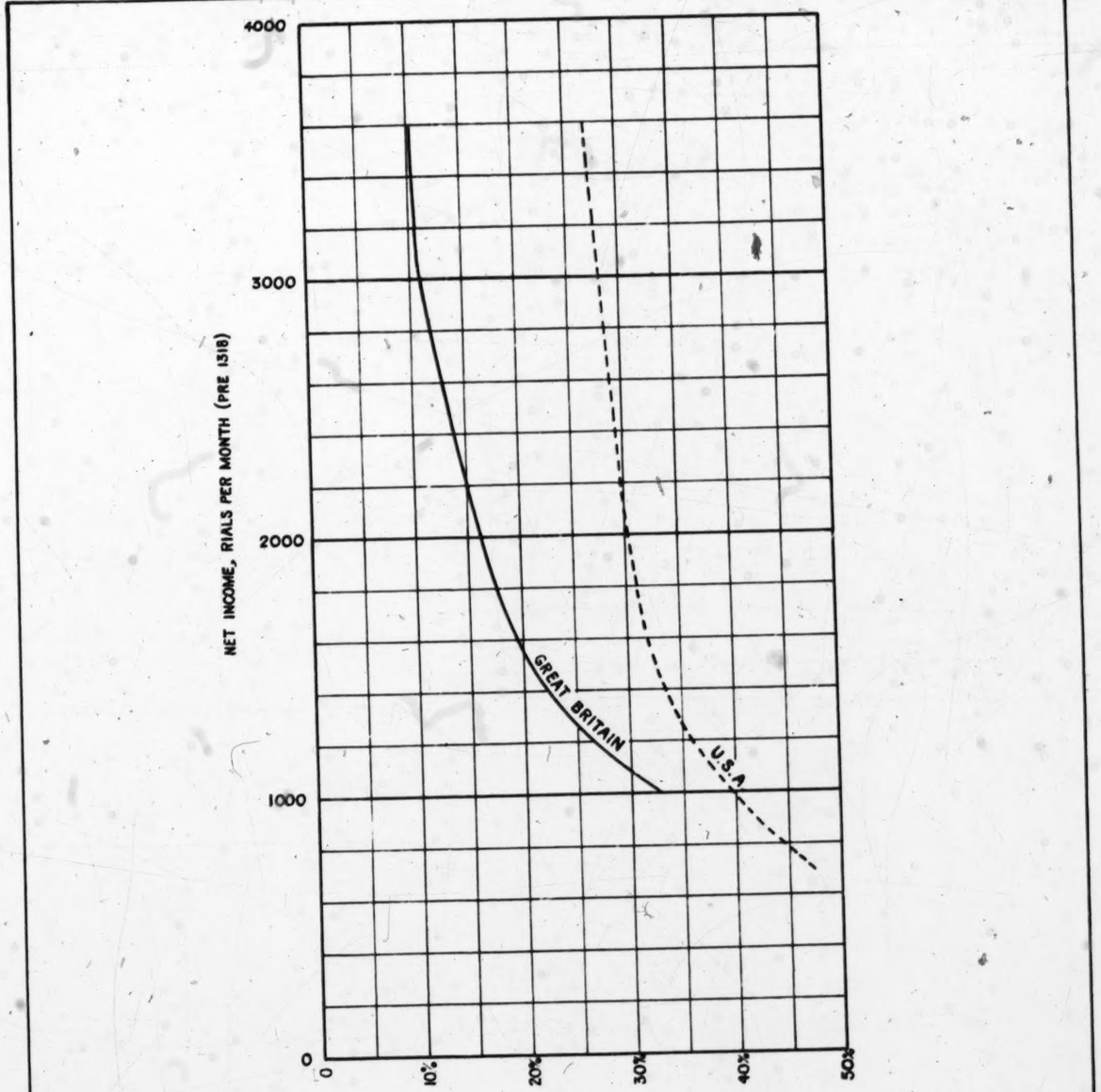
NEW YORK
1949

EXHIBIT G-3



RENT IN RELATION TO INCOME

OVERSEAS CONSULTANTS, INC.
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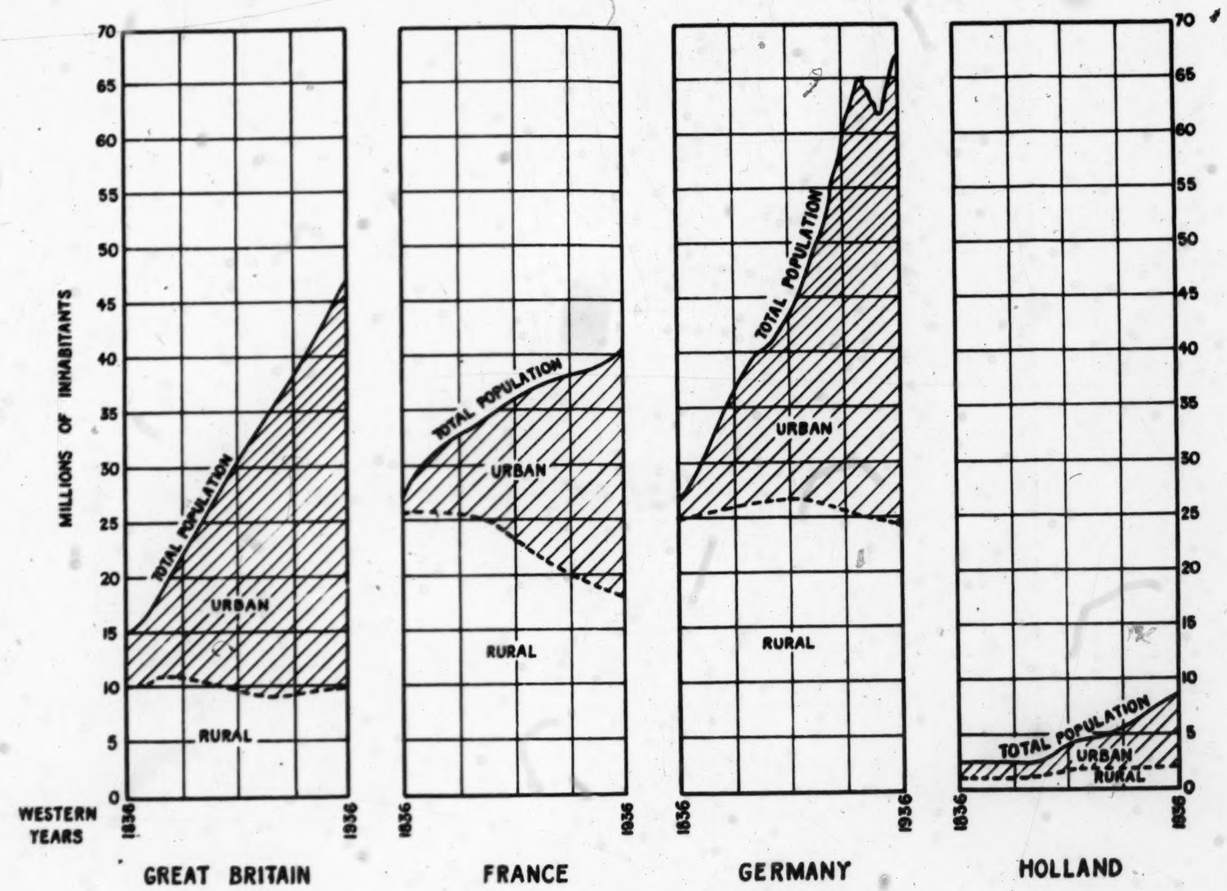
1949

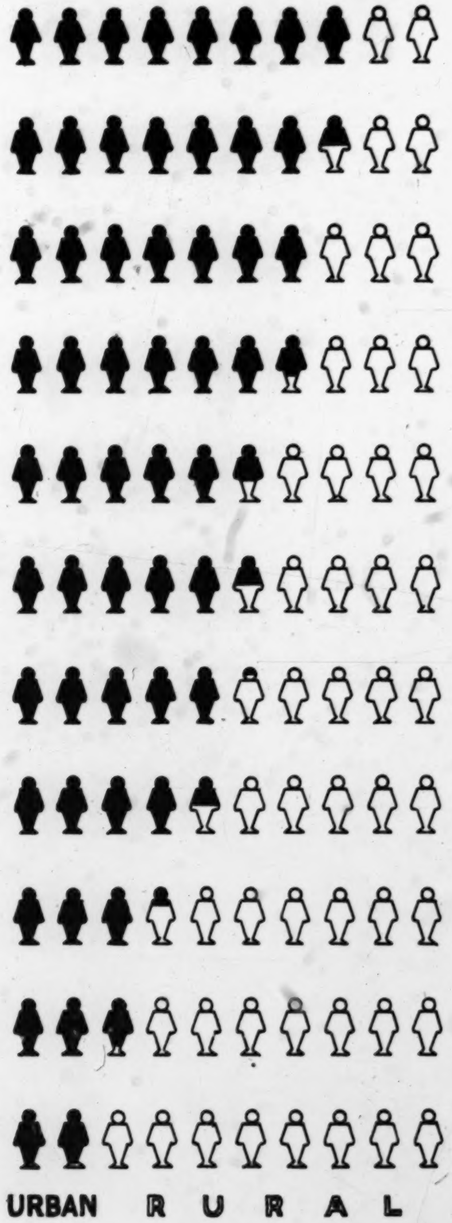
EXHIBIT G-4



PROPORTION OF URBAN TO RURAL POPULATION IN EUROPEAN STATES

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

EXHIBIT G-5



	URBAN	RURAL
ENGLAND AND WALES	80%	20%
HOLLAND	75%	25%
ITALY	70%	30%
GERMANY	67%	33%
U. S. A.	56%	44%
CANADA	55%	45%
FRANCE	51%	49%
PALESTINE	45%	55%
EGYPT	33%	67%
SYRIA	28%	72%
IRAN	19%	81%

PROPORTION OF URBAN TO RURAL POPULATION

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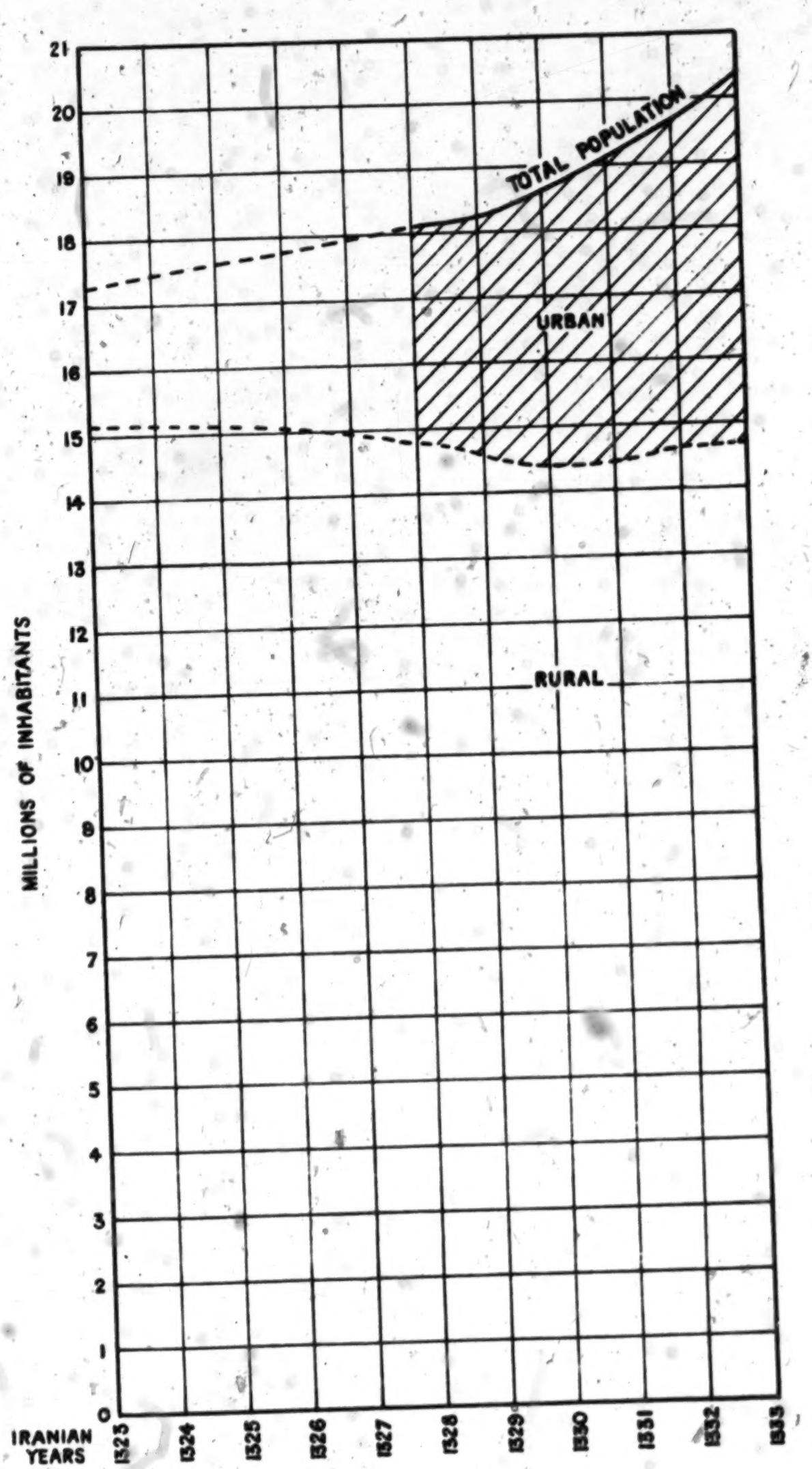
NEW YORK
1949

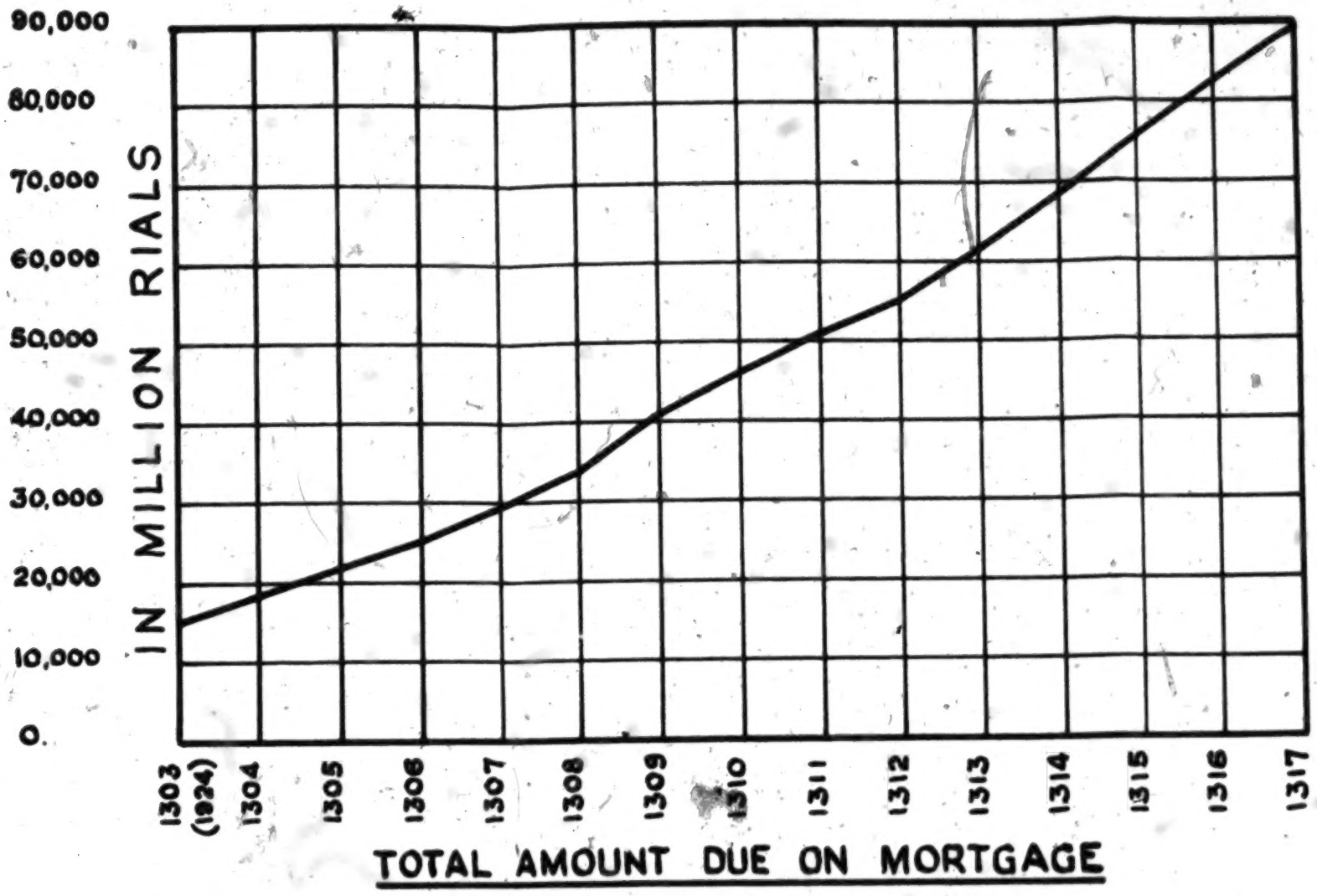
EXHIBIT G-6



ESTIMATED POPULATION TREND IN IRAN

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

EXHIBIT G-7

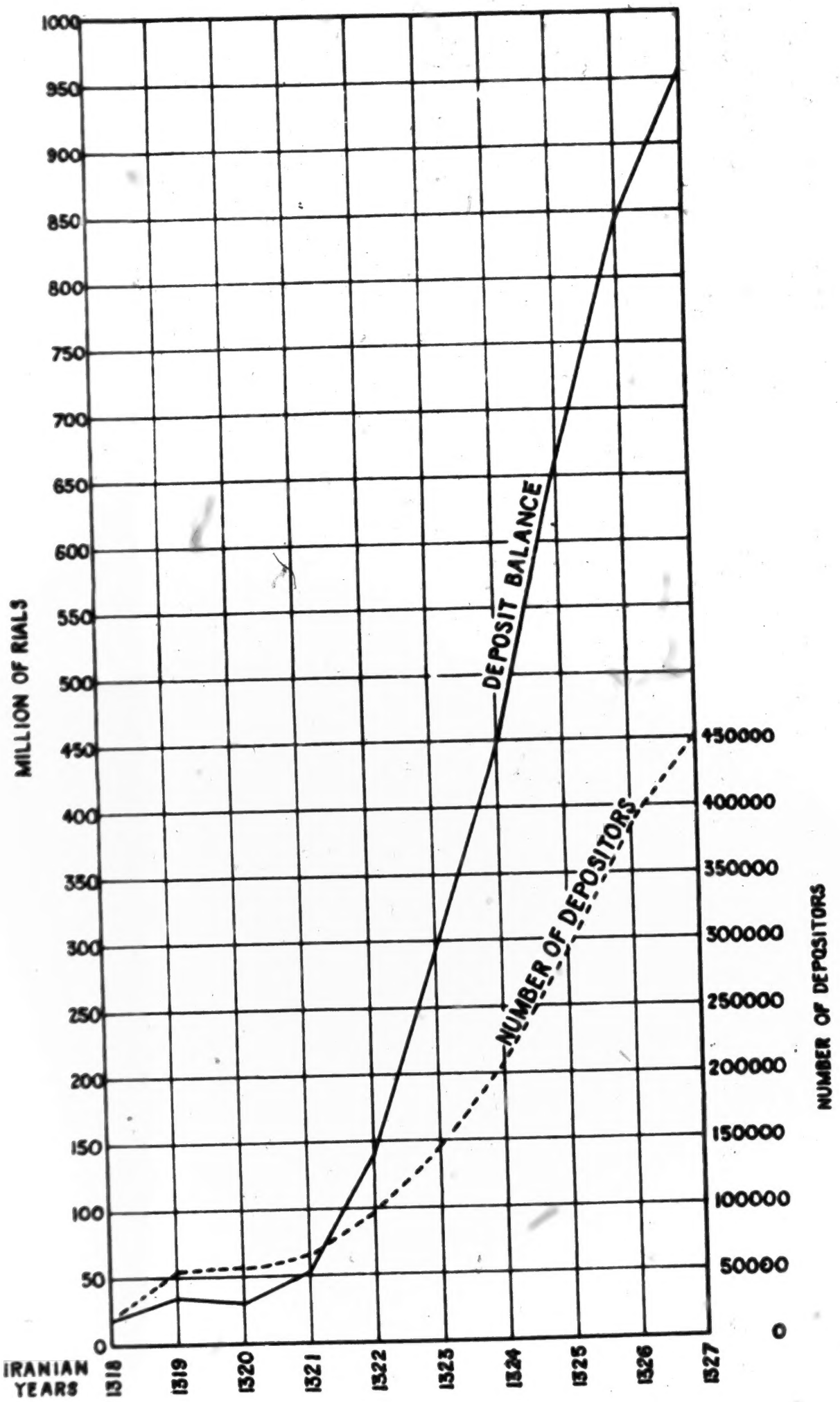


TOTAL AMOUNT DUE ON MORTGAGE

AMOUNT ADVANCED ON MORTGAGE DURING EACH YEAR.

GROWTH OF BUILDING SOCIETIES IN THE UNITED KINGDOM

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949



GROWTH OF SAVINGS
IN THE
NATIONAL SAVINGS BANK

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

INFORMATION SUPPLIED BY BANK MELLI IRAN.

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REPORT ON

SEVEN YEAR DEVELOPMENT PLAN

FOR THE

PLAN ORGANIZATION

OF THE

IMPERIAL GOVERNMENT OF IRAN

VOLUME IV

TRANSPORTATION

COMMUNICATIONS

INDUSTRY AND MINING

ELECTRIC POWER

PETROLEUM

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

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1950/ 1903

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TRANSPORTATION

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TRANSPORTATION

INTRODUCTION

The lack of adequate means of transportation has seriously impeded the economic growth and social integration of Iran. Large cities have grown up in the areas particularly favored by nature, but the commerce and industry of these cities has been largely limited to the immediately surrounding country and interchange of goods between them has been relatively small.

This condition, of course, has not been favorable to a well balanced economy. Regions well adapted to production of foods or manufactures in large volume have been restricted to a local market, while other regions deficient in such goods have had no means to supply the deficiency, even though capable of producing acceptable goods for exchange.

More serious, even, has been the fact that certain regions, because of crop failures, have endured virtual famine while other parts of the country had surpluses for which transportation was unavailable.

Exchange of goods with foreign countries has been impeded by these internal difficulties and also because Iran is somewhat isolated from the countries which would offer the best markets for its products and which produce the industrial articles which the country most needs. The Persian Gulf and the Gulf of Oman bound Iran on the south, but in order to reach the Mediterranean, a ship must make the long voyage around Arabia through the Suez Canal. The rail route to Europe through Russia which formerly carried various products of the northern provinces to market has been closed since the war and its reopening in the near future is very doubtful. There are no other workable routes to the west at present, and there is very small commerce with Afghanistan to the east, which is likewise deficient in transport. Farther south, an extension of the Pakistan railway crosses the border and proceeds 100 kilometers to Zahidan, but little traffic moves by this route. Most of the considerable traffic with India is by the Persian Gulf and connecting waters.

RAILROADS

Twenty-five years ago, Iran had only ten kilometers of railroad and practically nothing in the way of roads over which an automotive vehicle could be operated. Such roads as existed followed the ancient caravan routes and, in many cases, must have been but little better. In 1304 (1925), plans were laid to build a railroad from the Caspian Sea to the Persian Gulf by way of Tehran, and this line, from Bandar Shah to Bandar Shahpur, was begun in 1307 (1928) and completed in 1317 (1938). Its length was 1,388 kilometers and it was built to standard gauge of 4 feet 8½ inches. Prior to the completion of this line it had been decided also to link the country from east to west, and the construction of a line from Tehran to Tabriz, 741 kilometers, and from Garmsar to Meshed, 812 kilometers, was started in 1317. Garmsar is a station on the main line 114 kilometers east of Tehran. The impact of the war stopped work on these lines, but the Tabriz line was completed from Tehran to Mianeh, 439 kilometers, and 314 kilometers were built from Garmsar to Sharud, in the direction of Meshed.

During the late war, the Allies caused the port of Khorram-shahr on the Persian Gulf to be developed for the additional movement of supplies to Russia, and a branch railroad from Ahwaz, on the main line, was built to serve the port. Its length was 120.9 kilometers and the total length of all lines now operated as an integrated system is 2,262 kilometers.

There are two other sections of railroad within the country. One runs from Tabriz to Julfa on the Russian border, 148 kilometers, with a branch line 53 kilometers long from Suffian west to Lake Urmia. This road was built under Russian auspices some 35 years ago to connect with the line from Batum to Baku, and has the Russian 5-foot gauge. This line is now owned and operated by the Iranian Government, but is sadly deficient in motive power and other equipment. Its principal traffic is between Tabriz and Lake Urmia, where boats continue the service to a number of points on or near the lake. The other line is in the southeast portion of the country between Zahidan and the Baluchistan border, a distance of 100 kilometers. This road, as noted, connects with the Indian railroads, and is built to a 5 foot 7¾ inch gauge. Service is infrequent, and for a time before the war was suspended entirely.

With respect to lines under construction and not in operation, there are three. First is the line from Mianeh to Tabriz, 301.8 kilometers; second, the line from Shahrud to Meshed, 496.9 kilometers; and third, the line from Ghum to Yezd, 476 kilometers. This last line is practically completed from Ghum to Kashan, 98 kilometers, and is soon to be put into operation. The other sections are in various states of completion, but neither crossties nor rail have been purchased for any of them. The desirability of their completion is, therefore, an important question in relation to the Seven Year Plan and the economic development of the country.

ROADS

The development of the main arterial highways began about the same time as the development of the railroad, or some twenty-five years ago. The system, as a whole, was soundly conceived and calls for revision only to the extent of adding a few roads into sections where further development is contemplated under the Plan.

On the other hand, while the roads as constructed were, in most cases, undoubtedly a great improvement over those they superseded, they were not modern roads by present standards and are far from adequate for the easy and economical transport of goods and passengers which is considered necessary for the success of the Seven Year Plan. This criticism applies in different degrees to different sections, but there is no section which is not subject to criticism in some respects, even the main-traveled, asphalt-surfaced road between Tehran and Ghum, where proper drainage was neglected, insufficient embankment provided in numerous locations, and the original tortuous alignment allowed to remain in others.

Most of the country's roads are lacking the proper number of culverts, with the result that in riding over an otherwise smooth stretch of road one frequently comes to a sudden and steep declivity of a meter or more in depth with a similar sharp ascent on the other side. If the driver is anxious to avoid injury to his vehicle, his speed is immoderately reduced, while if his speed is a little too great, he pays for it by broken springs and undue strain on the entire machine. Along with this fault is a similar one, which is that many of the cuts are insufficiently excavated at the summit, with the result that a sharp ascent leads immediately to a sharp descent, with no proper transition between. This is also hard on the springs and frames of motor vehicles, even at low speeds, and is dangerous from the standpoint of visibility.

There are many places, also, where the reasonable speed of vehicles is limited by sharp curves which could be eliminated at relatively small expense.

Our study of the transportation system of Iran in relation to its economic and social life leads us to believe that the major cities, ports, and producing areas should be con-

nected by a system of ground transportation which should include a network of arterial roads, and that the construction of such roads should be such as to combine safety with reasonable speed of transit.

The amount of money allocated to transportation in the Seven Year Plan and the fairly light traffic density both indicate that these highways should be built with reasonable economy, and our report which follows will propose, for primary roads, a roadway of ample two-lane width, properly drained and culverted, and with a water-bound macadam surface in the first instance. When adequate settlement has taken place, it is contemplated that these roads would be given an asphalt surface six meters wide.

One of the probable reasons for the lack of highway improvements during the past few years has been the lack of any modern, labor-saving machines for road building and maintenance. With nothing but ineffective hand tools, the maintenance forces have had a difficult struggle to prevent further deterioration. One of our first recommendations will be the purchase of machines to make labor more productive and to release manpower for other activities contemplated under the Seven Year Plan.

Our proposals with respect to the roads to be built or renewed are shown in Exhibit H-1 and are described in the chapter headed "Roads".

SEAPORTS

The seaports of Iran are situated on the Caspian Séa to the north and on the Persian Gulf and Gulf of Oman to the south. The closing of the Russian border has caused considerable dislocation of the foreign trade of Iran, and has made the Caspian ports practically inoperative, except for the traffic of the fishing monopoly.

The port of Khorram-shahr near the Persian Gulf, and facing Iraq across the Chatt-el-Arab, had long been a principal point of call in the coastwise trade, but when the construction of the railroad was projected, Khorram-shahr was considered undesirable for security reasons and a new port was created at Bandar Shahpur, which became the southern terminus of the railroad. The competition of the railroad naturally drew traffic away from the ancient ports of Bushire, Lingeh and Bandar Abbass, particularly because the roads between these ports and the interior were very poor.

When it became necessary for the Allies to use Persian Gulf ports to supply Russia, the existing facilities at Khorram-shahr were enlarged, the harbor dredged, and the railroad extended to the port as heretofore noted. Since the war's end, the great bulk of the country's exports and imports have moved through this port and Bandar Shahpur.

It is expected that the working of the Seven Year Plan will cause a considerable increase in the external trade of Iran, and for this reason, as well as to provide a better geographical distribution of port facilities, it is proposed to improve the ports of Khorram-shahr, Bandar Shahpur, Bushire, and Bandar Abbass, all on the Persian Gulf, with the intention of providing an ultimate capacity of 5,000,000 tons per annum. It is also proposed to make studies for the future development of Chabahar, on the Gulf of Oman, which would serve the eastern portion of the country and which has certain strategic value as well. Studies of the future development of Farahabad, Asalu and Ghishm are also contemplated.

AIRPORTS

Aviation has not yet assumed great importance as a transportation agency in Iran, and this is a condition which must be remedied in order to secure the well-rounded system of transportation facilities which the development of the country calls for. Distances

between the larger cities are comparatively great, ground transportation at best will be comparatively slow, and the economic integration of the country will require more frequent journeys by officials and executives. All these factors indicate an increasing demand for air transportation.

The country at present has one airport of the first, or international, class. This is Mehr-abad, which serves the city of Tehran. Another field, at Abadan, is capable of being made a first-class airport, and plans have been made with this in mind.

There are also airports at major cities such as Tabriz, Meshed, Isfahan, Shiraz, Ahwaz, Bandar Abbass, Kerman and Zahidan, but, except for the last two, none of them have paved runways or terminal buildings for the accommodation of passengers. The runways at Kerman and Zahidan were paved by the Allies during the war to expedite traffic between India and Russia.

A more or less regular service of one or more flights per week is supplied to the principal cities by Iranian Airways, with some rebuilt Dakota aircraft, purchased from the American Army. It seems clear that the provision of all-weather runways, air-navigational aids, and passenger accommodations, along with better aircraft, would considerably stimulate the use of air travel.

It would clearly be impractical for private capital to undertake the development of airports at this stage, and therefore our report recommends a program under the Seven Year Plan including further airport development at Mehr-abad and Abadan, and the improvements of some fifteen other fields with paved runways, buildings and other facilities. Certain desirable improvements in navigational aids and controls are now under way, and these may be supplemented by funds made available under the Plan.

HOTELS

While the Plan Act stipulates that the construction of hotels to attract foreign tourists should be provided for, it does not include funds for this purpose. We have not made any recommendations of specific projects for hotels, as we believe that such undertakings should be made by private investors as strictly commercial enterprises.

GENERAL

A matter of imminent and urgent importance in the field of transportation is the present condition of the railroad and the seaports. This condition is now approaching a point where it may seriously cripple the entire economy of the country and cause unnecessary hardship to its people. Its correction is an absolute prerequisite of any economic improvement to be produced by the Plan.

This situation has had a number of causes, but the most serious has been the deterioration of the railroad's motive power. This, in turn, is attributed to lack of spare parts and other materials required for repairs. We have reviewed this situation, as well as the general condition and operation of the railroad, and recommend the immediate purchase of certain materials required from abroad. We shall also recommend measures for the permanent administration of the seaports.

The sections which follow cover, first, the present situation of the railroad, with recommendations for improvements in plant and methods; second, the proposed extensions of the railway lines; third, the proposed highway system; fourth, the development of the seaports; fifth, the proposed development of aviation facilities; and sixth, the implementation of the program.

Exhibit H-9 shows the proposed construction program with expenditures for roads, seaports, airports and railroads.

THE PRESENT RAILROAD SYSTEM

DESCRIPTION

The presently operated lines of the Iranian State Railways are these:

Line	Length (Kilometers)
Bandar Shahpur—Tehran	927
Tehran—Bandar Shah	461
Garmsar—Shahrud	314
Tehran—Mianeh	439
Ahwaz—Khorram-shahr	121
Total	2,262
Disconnected from main system:	
Tabriz—Julfa	148
Sufian—Lake Urmia	53
Total	201
TOTAL	2,463

In addition, there is the line from the Baluchistan border to Zahidan operated by Pakistan personnel, ownership not established, 100 kilometers in length.

Exhibit H-2 shows the existing railroad system and the lines under construction.

The main line of the Iranian State Railways extends from Bandar Shahpur on the Persian Gulf through Tehran to Bandar Shah on the Caspian Sea, a distance of 1,388 kilometers. Starting at sea level at Bandar Shahpur, it crosses a plain through Ahwaz to Andimishk. At that point, it starts an ascent, passing through a wide valley and then cutting over into the gorge of the Karun Rud which it follows until it finally breaks through the mountains and comes into open country at Dohrud. The most difficult section is between Andimishk and Dohrud (km 46), 208 kilometers, where the ascent is 1,172 meters. The construction of this division was one of the most difficult anywhere in the world, involving 114 tunnels, of which many are more than one kilometer in length. On one section, 10 kilometers long, 8.2 kilometers of the distance is in tunnels. The ruling grade is 1.5 per cent.

North of Dohrud the line continues its ascent through open country (only five short tunnels) to a summit 2,217 meters above sea level between Fowzieh (km 388) and Naurabad (km 373). It then drops down to Arak (km 320), elevation 1,759 meters, which is a main division point. The line continues on in a northeasterly direction through Ghum, reaching a low point at Nowdaje (km 148), elevation 905 meters, and then continues across rolling country to Tehran where the elevation is 1,117 meters at the station.

The northern section starts in a southeasterly direction from Tehran to round the nose of some projecting mountains, then skirts the northern end of the Dasht-i-Kavir to Garmsar (km 114). The low point is at Kavir (km 88), elevation 793 meters. The south winds from the desert blow a great deal of sand across the track at this point, which often impedes traffic and necessitates clearing the track to prevent stalling the trains. Proceeding northeasterly from Garmsar, the line climbs through a narrow valley and has many tunnels. It finally reaches the summit just beyond Gadouk at an altitude of 2,112 meters. The descent from the summit to the shores of the Caspian Sea presented

unusual problems and called for the highest degree of engineering skill. In addition to a large number of tunnels, it was necessary to make three complete loops of the line in order to gain distance and not exceed a maximum grade of 2.8 per cent. For some 66 kilometers between Pul-i-Sefid (km 286) and the summit, the grade is a steady 2.8 per cent compensated for curvature (except at stations). One of the loops is unique in that the line in one tunnel is directly above itself in another tunnel. The line reaches the coastal plain at Shahi (km 334), elevation 52 meters, and continues near the southern shore of the Caspian Sea to Bandar Shah, elevation minus 23.4 meters. (The surface of the sea is minus 26 meters). The distance from Tehran to Bandar Shah is 460.8 kilometers, the last 126 kilometers being along the coastal plain. There are some hundred tunnels in this northern section.

From Ahwaz a branch extends in a southerly direction to Khorram-shahr, located at the junction of the Karun Rud and the Shatt-el-Arab, a distance of 120.9 kilometers. This line is practically level and at no point is it much above sea level. Early in the present year, a great deal of damage was caused by flood waters and several weeks were required to restore service.

From Tehran, a line was begun in a northwesterly direction, the ultimate destination being Tabriz. Construction has been completed to Mianeh, 439.2 kilometers from Tehran. The construction of this section was not particularly difficult; the line lies in a wide valley for most of its length. Many long tangents occur in the first section from Tehran to Kazvin (km 144). At that point, the grade becomes more continuously upward until a summit is reached on a flat wide valley at Pirzagheh (km 261), elevation 1,802 meters. Beyond that point, the grade descends to Mianeh, elevation 1,071 meters. The distance from Mianeh to Tabriz is 302 kilometers.

From Garmsar, the projected line to Meshed was completed eastwardly to Shahrud, 314.6 kilometers. The first 57 kilometers is practically level. The next 121 kilometers is on an ascending grade, the summit occurring at Haft Khan (km 293), elevation 1,666 meters. The line then drops to Amravan (km 333), elevation 1,064 meters, continues over rolling country to Zarrin (km 386), elevation 1,081 meters, and then climbs to Shahrud, elevation 1,309 meters. The distance from Shahrud to Meshed is 497 kilometers.

Another line turns southeasterly at Ghum. At present, it is constructed for 98 kilometers, to Kashan, but at the time of writing was not yet in operation. The ultimate present destination is Yezd, 476 kilometers from Ghum. There has been consideration for an ultimate extension of this line through Kerman to Zahidan, where connection could be made with the wide gauge line extending into India but that would be something for the remote future. It was expected that the line from Ghum to Kashan would be opened on 1 Khordad, 1328 (May 22, 1949).

Azarbaijan

A line was constructed by the Russians from Julfa on the U. S. S. R. frontier to Tabriz, a distance of 148 kilometers. It starts at an elevation of some 750 meters above sea level, crosses a summit of over 1,750 meters elevation and terminates at Tabriz at an elevation of 135 meters. At Sufian, a branch extends westwardly a distance of 53 kilometers to Sharaf Khaneh on the shores of Lake Urmia. Railroad-owned boats on Lake Urmia continue the service to various points on the lake. The gauge is the same as the Russian (5 feet). Title to this line has passed to the Iranian State Railways and it is now operated by that Administration.

Zahidan-Mirjawa

This line of 100 kilometers was built by the British during World War I as an extension of the Indian Railways, to expedite aid to Russia. It fell into disuse following that war and remained inactive until World War II. The necessity of again getting aid to Russia in World War II resulted in the rehabilitation of the line. It is at present being operated entirely by Pakistan personnel on the basis of one passenger train and one freight train per week. The ownership is not at all clear.

CONDITION OF PROPERTY

Track

The track of the Iranian State Railways is, in general, in good condition, the alignment is excellent and the maintenance of the surface has been carefully done. The ballast and surface of the line, on the whole, is much better than the average line in America handling corresponding amounts of traffic. Very few American railroads handling volumes (amounts) of traffic similar to the Shahrud or Mianeh lines have rock ballast. Furthermore, the construction has been done in an excellent manner of which Iran may well be proud.

Traverses (Ties)

An important question in connection with the track is the choice between wooden and steel traverses. The maintenance department of the railroad has had excellent service from steel traverses and rather poor service from wooden traverses. The steel traverses work out exceptionally well by reason of the generally dry climate.

The unsatisfactory service given by wooden traverses is due primarily to the inadequate preservative treatment given them. They are not seasoned for a long enough time before impregnation, and the type of impregnation is not suitable to give the length of life that should be obtained. Its use was apparently dictated by its low cost compared to creosote, which is the treatment generally used in America. The average life of creosoted ties in the United States is between twenty-five and thirty years, which is many times the average life in Iran.

We recommend that creosoted wooden traverses be adopted as standard for new construction, and that steps be taken immediately to get the impregnating plant at Shirgah in condition to use creosote.

We may point out as a future possibility the use of impregnating materials obtained from the distillation of petroleum or coal. The co-operation of Anglo-Iranian Oil Company should be obtained for the development of such materials on an experimental basis.

Rail Joints

On the existing lines, the rail joints are generally placed opposite each other. This was done to save steel traverses since it was necessary to space them more closely at the joints. Modern construction calls for staggered joints (opposite joints being half a rail length apart). This preserves the alignment in much better condition and with less labor for maintenance. When wooden traverses are used, the matter of their spacing is not nearly so important. The preservation of alignment on curves is much more important, and is much more easily accomplished with staggered joints. The tendency for track to kink (bend at the joints because of expansion) is also much less.

Ballast

The ballast, in general, is very good. However, some of the stone is somewhat large. Use of a uniform smaller size is much better, particularly when wooden traverses are used, as more supporting points distribute the load more uniformly.

Rail

Considerable complaint was heard from railroad officers as to the condition of the rail and the need for unusually heavy expenditures for replacements. Although the railroad carried a fairly heavy volume of traffic during the war, the rail is all fairly new, and our inspection disclosed little distortion or excessive wear.

It is felt that new rail requirements for the main line can be considerably offset in connection with the construction of new lines under the Seven Year Plan. The bulk of the rails calling for replacement are on curves, particularly in the mountain section. Inasmuch as it will be years before the line to Meshed approaches the main line in density of traffic, the removal of partially worn rails from the main line and their installation on the comparatively straight line to Meshed will reduce the investment needed at the present time and also conserve foreign exchange. This corresponds to the practice in America of placing new rails only in main line track and shifting the worn rails to secondary lines where, because of lighter traffic, they frequently last for many years.

The placing of new rails on the Meshed line would not be an economical use of capital. There is no present probability that its traffic will ever approach the volume transported on the line from Tehran to the Persian Gulf, and for that reason its rail requirements can always be adequately met by laying used rail taken from the southern line.

Locomotives

The following is a list of locomotives now on the railroad:

	In Service	Needing Repair	Beyond Repair	Total
Road Locomotives				
Mikado (American)	69	1	0	70
Decapode (Ferrostahl)	5	10	1	16
Consolidation (Ferrostahl)	19	29	1	49
Garrat (Beyer Peacock)	2	2	0	4
Mikado (Nohab)	1	11	0	12
Consolidation (Beyer Peacock)	0	5	0	5
Santa Fe (Krupp)	5	1	0	6
Consolidation (W. D. English)	0	9	13	22
Ten wheel Krupp	0	0	10	10
Wide Gauge (Azarbaijan)	2	0	0	2
Wide Gauge (Azarbaijan)	2	9	0	11
	105	77	25	207
Yard Locomotives				
Diesel Davenport	20	4	0	24
Krupp	0	0	2	2
Krupp	1	1	8	10
Baldwin	1	3	0	4
Henschel	3	0	0	3
Kitson (English)	3	0	0	3
Wide Gauge (Azarbaijan)	2	0	0	2
	30	8	10	48

The locomotive equipment has all been purchased from abroad, the largest single class being 70 American Mikados (one-third of the road locomotives). They are capable of hauling 450 tons up a grade of 1.5 per cent. The Sante Fe type locomotives, built in Germany, having an extra driver, are stronger and will haul 500 to 520 tons. Due to the weight limitation made necessary by the size of the rails, these tonnages are somewhat lower than might be desired. To overcome this limitation on the heavy grade lines in the north, the Garrat (Beyer Peacock) locomotives were designed. These are two separate locomotives with the boiler suspended between them. They are difficult to maintain and expensive in operation. The stress placed on weight reduction resulted in the frames and other parts being lightened to the point of frequent failure. This means excessive time out of service and high maintenance costs.

When locomotives are badly worn by reason of high mileage, they are often assigned to yard service, ten being so assigned at the present time. The bulk of the shunting work is done by light 20-ton Davenport direct-drive diesel locomotives. These are very light, a fact which often slows up their work.

The very large proportion of locomotives either in need of repair or classified as beyond repair has been a serious handicap to the railroad in the handling of its traffic. The reason for this condition has been the failure to obtain the necessary repair parts, which must be purchased from abroad.

The expenditures for locomotives and car materials and for maintenance-of-way metallic materials, which call for foreign exchange, have been pitifully small. In 1327 only $800,000 was spent for foreign exchange. This is just a fraction of what is needed to maintain the property and to provide for new power and equipment as needed.

As a result of this policy, the mechanical department has been forced to take parts from some of the locomotives in order to keep the others in operation, with a consequent steady reduction in the number of serviceable units.

The only solution for this serious situation is to order immediately the parts and materials needed from abroad and apply them as quickly as possible. Failure to do so may result in a serious transportation crisis before the present year is over.

Passenger Cars

There is a total of 50 passenger cars and 10 postal cars as follows:

Class	No. of Axles	In Service	For Repair	Beyond Repair	Total
I	2	5	0	0	5
II	2	4	0	0	4
II	4	10	0	0	10
III	2	29	0	2	31
Postal	2	10	0	0	10
Total		58	0	2	60

Practically all the four-axle cars are used on through long-distance runs.

The passenger cars were nearly all constructed abroad and, in general, are duplicates of the usual European types. The first, second and most of the third class coaches have side corridors, making for easy communication regardless of place, movement or weather. The seats in the compartments face each other. The backs are pivoted and can be swung up into a horizontal position so that a total of four bunks can be provided for

sleeping. The difference between the first and second class accommodations lies in minor refinements, while the third class compartments are generally equipped with wooden seats.

There are no passenger cars officially designated as fourth class equipment. There are, however, a number of box cars in use, with or without windows, and equipped with wooden benches, which are used for fourth class. There are no platforms on these cars and the passengers climb in and out as best they can, generally requiring the help of other passengers.

Freight Cars

The number, type and condition of the freight cars are as follows:

Type	No. of Axles	In Service	For Repair	Beyond Repair	Total
Covered	2	1,148	185	97	1,430
Covered	4	199	20	0	219
Sideboards	2	895	25	16	936
	4	131	45	10	186
Flat	2	190	0	4	194
	4	125	2	0	127
	6	1	0	0	1
Tanks	2	103	0	0	103
	4	668	63	34	765
Ballast	2	114	0	6	120
Couplages	2	74	0	5	79
Inspection	2	29	0	0	29
Refrigerators	2	20	0	0	20
Total		3,697	340	172	4,209

The bulk of all classes of freight cars, except tanks, are of the two-axle type which is standard all over Europe. These cars are generally framed on the side, on account of the pedestal attachment. The journal boxes are sprung direct in these pedestals. This makes for limited center (or pulling) strength. They have the usual European buffer and hook and screw type of coupling, an attachment that has a limited strength and, therefore, limits trains to moderate or light tonnages.

Recently, a number of four-axle cars were procured. They number 1,123, some 26 per cent of the total. They are built to American standards and capacities, being equipped with standard swivel type cast-steel trucks. Inasmuch as the load is transmitted to the trucks through a center plate, the center sill is of strong construction. This means a strong backbone structure that can be used for the heaviest locomotive pulls. The limit of pull is at present established by the hook coupling mentioned above. However, the center sill in these cars was designed and constructed to take standard automatic couplers. The changeover could be made without major modification of the sill.

Note on Couplers

As stated, the rolling stock has been designed along European lines. In Europe the cities and towns are very close together and the population is dense. Nor are any of the European states (except Russia) as large as Iran. Germany is only 400 miles long by 500 miles wide. Similar distances in the other countries do not exceed 700 miles. Even the distance from the south of England to the north of Scotland is only about 600 miles. But Iran is 1,100 miles long and 1,100 miles wide. From the northwest of Azarbaijan to

the southeast Indian frontier is 1,600 miles. These distances approach distances in America. Because of distances, and the distribution of population, more consideration should be given to the general features of American design. Longer distances make heavier loads—both car and train—more economical. European practice has been more along shorter distances and lighter loads—both car and train. At present, Iran is midway between these two general practices. The railroad is transporting almost half of its traffic (principally oil) in 10,000-gallon tank cars and is finding it economical to do so. The use of automatic couplers is a natural corollary. Because they are stronger, they permit the hauling of longer and heavier trains, which will be possible with modern diesel locomotives.

The present four-axle equipment—tank cars and goods wagons—can be changed to heavier automatic couplers without serious difficulty or great cost. In the interim, it will be necessary to have the heavier cars with automatic couplers in one group and the lighter cars with European couplers in a second group, at the rear of the train. This can be done in Iran as it has been done in other countries during the transition period.

FINANCIAL RESULTS

There is shown below a condensed statement of revenues and expenses of the Iranian State Railways for the years since the railroad has been in operation. These figures came from the railway's accounting department and data are not available to conform expense accounts to American categories and so reach a comparison of efficiency in operation:

Revenues and Expenses

Year	Revenues (Millions of Rials)	Expenses (Millions of Rials)	Income	Operating Ratio
1318(1939-40)	130.0	75.0	55.0	57.7
1319(1940-41)	190.0	40.0	150.0	21.0
1320(1941-42)	205.0	108.0	97.0	52.7
1321(1942-43)	565.0	304.0	261.0	53.8
1322(1943-44)	1,385.6	784.9	600.7	56.6
1323(1944-45)	1,819.6	1,141.9	677.7	62.7
1324(1945-46)	779.3	834.3	—55.0	107.0
1325(1946-47)	711.8	759.0	—47.2	106.6
1326(1947-48)	819.6	883.2	—63.8	107.7
1327(6 mos. 1948)	404.8	.4		

Depreciation is not included in the expenses.

It will be noted that revenues in the first few years were very small, considering the length of the line, and then mounted to Rls. 1,819,600,000 at the peak of the war movement. It will be further noted that while revenues declined 53 per cent from 1323 to 1326, operating expenses declined only 23 per cent, and the ratio of expenses to revenues increased from 62.7 per cent to 107.7 per cent. There are several explanations for this result, among which are the effect of inflation, the excessive number of employees, and a possible decrease in efficiency.

Operating Revenues

Operating revenues for the year ended Farrardin 1, 1326 (March 21, 1948) were earned as follows:

	Rials (Thousands)
Goods	628,209
Animals	11,553
Vehicles	7,713
Total freight	647,475
Passengers	109,902
Other	62,252
Total	819,629

This table indicates the great importance of the freight traffic in the total business of the railroad.

Freight Traffic

Practically all traffic moves on class rates, which in Iran means a given rate per ton-kilometer. Tons of freight handled in each of the rate groups and the rate for each in 1326 were as follows:

Class	Tons	Rate Per Ton Kilometer-Rials
I	244,138	1.40
II	221,807	1.20
III	304,914	1.00
IV	48,369	0.80
V	273,655	0.60
Azarbaijan	21,178	
Total	1,114,061	

It is interesting to note that more tonnage moves at third class rates than at any other. This strikingly illustrates the fact that the Iranian railroads are completely lacking in the heavy, low-rated commodities which are the backbone of American railway traffic.

Diesel and furnace oil and kerosene all move at Rls. 0.90 per ton-kilometer, which was a rate agreed to by the Government to reduce the cost of these products to the consumer. They are included in Class III above. On the other hand, asphalt and benzine are both in Class I.

There has not yet, except for the petroleum products first mentioned, been any attempt to encourage the production or consumption of any class of goods, or the development of any area, by granting special, or "commodity", rates to make different regions or commodities more nearly competitive with each other. The growth of the United States over the last century owes much to the establishment of such a rate structure, and today only a small proportion of the traffic moves on class rates. Even these are not based strictly on distance, since the average rate per ton-kilometer decreases as the distance

increases. The table below shows the division of traffic by principal groups for the three years 1324-1326 (1945-1947). We assume that this is a reasonably normal distribution in the present state of the economy.

Amount of Goods Carried by Iranian State Railways

	1324	1325	1326
		—Tons—	
Petroleum products	303,445	376,727	413,190
Minerals	28,771	39,888	42,725
Textiles	31,560	16,744	13,222
Agricultural	209,984	207,589	147,959
Foodstuffs	87,849	81,076	137,572
Metals	274,352	69,072	37,553
War materials	1,421		
Vehicles	249		
Forest products	95,108	46,558	46,098
Construction materials	39,936	14,396	80,581
Miscellaneous	250,160	15,968	195,156
Total	1,322,835	868,018	1,114,056

It will be observed that petroleum products rank first in importance by a wide margin. It is important that a greater consumption of kerosene and fuel oil be obtained throughout the country to halt the destruction of the forests, and to do this, it is important that transportation costs be brought down.

Highway vehicles are competitive with the railroad, and seem to be carrying a large proportion of the traffic. On the other hand, the trucking business is not well organized and is not considered particularly reliable or responsible, so that the failure of the railroad to supply wagons for loading and to move them promptly when loaded must play a considerable part in the present situation.

Passengers

In the year 1326 (1947) there were carried 1,588,014 passengers for an average of 231 kilometers apiece. Between classes, these passengers were divided as follows:

Class	Passengers	Rate in Rials per Passenger-Kilometer
I	7,884	0.85
II	82,299	0.50
III	737,152	0.30
IV	760,749	0.20
Total	1,588,084	

Only about six per cent of the passengers travel on first or second class tickets. This, we are sure, is in large part due to the scarcity of cars to accommodate this traffic. As a matter of fact, passenger cars of all classes are scarce, and this scarcity is driving away business, to the detriment of the railroad's revenues. Buses on the principal routes are frequent and uniformly full.

Operating Expenses

The wartime boom load brought about an increase in the personnel to 35,498 in the year 1322 (1943). Following the war, there was a sudden and heavy drop in the traffic and personnel was considerably reduced. This reduction brought complaints and political pressure to an extent that further reductions were suspended. The resulting situation is frankly recognized by the responsible officials, who say that they could handle twice the traffic with but a small increase in personnel.

The over-all cost per ton-kilometer for the Iranian State Railways is about Rls. 1.08. In the United States the average cost per ton-kilometer is less than Rls. 0.2. While the American lines enjoy higher efficiency by reason of heavier train loads and heavier loadings per car, this is offset by the lower wage per hour for employees on the Iranian State Railways. From this comparison can be seen the opportunity to bring down the cost per ton-kilometer. Even a moderate reduction in the cost per ton-kilometer with a corresponding decrease in rates would prove a real stimulant to the national economy.

While the admitted excess of personnel and the lack of the accustomed measures of performance prevent any detailed analysis of the present operation, there are a number of observations we may make as a result of our inspection which indicate opportunities for economy.

Switch Operation

All mainline facing point switches are operated during train movements by assistant station masters. Practically all the trailing point switches are likewise operated. This calls for a large number of men. On some lines, as little as one train a day moves over certain switches. This means but little productive work out of the men who are needed for no other purpose than to furnish this protection. In America, as well as many other countries, train movements are safeguarded by locking the switches. The usual arrangement is to install a switch stand some two meters high with distinctive targets and lights to indicate the position of the switch. Switches on main lines are locked, and trainmen are provided with keys to change the switch position as necessary. The adopton of such switch mechanisms in Iran would increase the economy of operation and release men for other productive work.

Station Signals

All of the main line operation observed was by use of "absolute block" systems, either by staff or by signal. This is a very safe, though somewhat primitive, operation. The stopping of a train at each station for orders consumes much time and involves greater wear and tear on the equipment. Efforts are being made to eliminate unnecessary stops and several cases were observed where this had been done. However, such operation calls for much advance planning and communication of extra information to train crews at previous (advance) stations in order that a train may pass any given station without stopping.

This difficulty could be avoided by the installation of signal towers at stations, eight to ten meters high and equipped with targets and lights, by means of which permission to proceed could be given and observed by engine crews at sufficient distance to avoid a slow-down or stop.

Staff Systems

On certain sections, staff signal systems are in operation. This system requires that a train cannot enter a given block unless the engineer has the "staff" for that block in his possession. This is a safety method which should be confined to sections where the vision is generally short and tunnels numerous. In open country it is an unnecessary precaution. Where staffs must be used, however, it is possible to give them to enginemen of trains moving by stations at moderate speeds. The high station signal should inform the engineer that he is about to receive a staff and thus make it unnecessary for him to stop his train. A freight train pulled by a diesel locomotive should be able to run for 100 kilometers or more without a stop. The provision of a high station signal is essential to reduce the number of stops to a minimum.

Water Service Stations

From ten to twenty minutes are consumed at water stations in refilling the locomotive water tank. This is because the service stands are too small. At one station we observed an ordinary hose being used to fill the tank. Larger water service stands should be provided to speed up this operation and save time. Refilling of the locomotive water tank should be done in not more than five minutes. This saving would mean a considerable saving in the total time required to go from one end of a division to the other.

Highway Crossings

Almost all of the grade crossings with highways were observed to be guarded by watchmen. Many of these were in open country where an approaching train could be seen for many kilometers. In such cases, this protection is quite unnecessary, and in normal circumstances these men should be released for other work.

Marshalling Yards

The operation in the marshalling yards where cars are classified is slow by reason of the design of the yards and the necessity of making a careful stop each time a car is coupled or uncoupled.

In several European countries, the marshalling operation has been greatly speeded up by the raising of the track leading to the yard so that cars will run into the yard by gravity. The raise can be moderate so that the speed of the cars entering the yard tracks is not excessive. Or, if bad winter conditions slow up the free running of cars, the raise can be made greater and skates (rail stops) can be placed by special yard men to check and stop the cars where desired. When these rises (small humps) are used, it is possible to take a train of cars, make all the uncouplings at one time, then push the train over the summit of the rise at a slow speed and make all of the classifications in one movement. At present it is necessary to stop and reverse the engine to place each car.

With this arrangement, it would be possible to handle many more cars per hour through the marshalling yard with the same number of shunting locomotives. In addition to saving locomotive time and the time of yard forces, the entire operation of the line would be expedited and the availability of goods wagons considerably increased.

This suggested change in yard arrangement could be accomplished without the use of important materials.

Railroad Police Force

The entire railroad is thoroughly protected by uniformed police and in many places it appeared over-protected. Every station was guarded by one or more men. The force is composed of 1,396 men and 62 officers, or 1,458 in all, three men to each five kilometers of line.

It would seem to us that the protection of station property in cities was the duty of the municipal authorities and, in general, that the force was considerably larger than need be.

Officials

Mention was made earlier in this section of the difficulties encountered in attempting to reduce the present railway personnel. We note, on the other hand, that from the year 1324 (1945) to the year 1327 (1948) the number of employees classed as "officials" increased from 6,108 to 7,349. With an otherwise static force, admittedly much greater than necessary, this increase seems uncalled for, and an investigation should be made as to the possibility of substantially reducing the number of employees in this higher salary bracket.

REHABILITATION PLANS

The railroad administration expects to receive £5,700,000 or the official equivalent of $22,800,000 to be paid by the British Government in settlement of war traffic claims. This is all foreign exchange which the railroad plans to expend as follows:

Item	Amount
24 Santa Fe type locomotives	$ 2,800,000
30 Santa Fe type locomotives	4,000,000
50 Passenger and dining cars	3,200,000
20 Shunting locomotives	800,000
Spare parts, American type and diesel locomotives	400,000
General parts (spare)	2,400,000
Spare parts, Santa Fe type locomotives	400,000
Electrical and mechanical installations	800,000
Communications	400,000
Maintenance-of-way material	2,800,000
Inspection and transportation	800,000
Repayment of loan	4,000,000
	$22,800,000

Equipment Requests

The mechanical department of the railroad feels that the following material and equipment is necessary for rehabilitation as well as to provide for potential expected increases in traffic.

Item	Amount
Road locomotives (steam)	$12,000,000
Yard locomotives (diesel)	800,000
Self-propelled cars (diesel)	2,500,000
Passenger cars	14,000,000
Freight cars	14,000,000
Machinery	2,500,000
Repair parts for equipment	2,500,000
Stock	700,000
	$49,000,000

We have examined these proposals and have discussed them with the responsible officers of the railroad. We differ with them to some extent both as to kind and amount of equipment, and as a result of our study have prepared our own recommendations for additional equipment required during the next seven years, divided between what should be ordered immediately and what may be deferred to the second to seventh years, inclusive. It will be noted that the total expenditure recommended exceeds by only $1,423,000 the amount of $22,800,000 from the British settlement reduced by the $4,000,000 assigned to debt repayment, and would, therefore, be a charge against the Seven Year Plan only to that extent.

It should be said, however, at the time of this writing, that this payment has not been accepted by the Iranian Government, and that when it is received, there is no positive assurance that it will be turned over in whole amount to the railroad administration.

With respect to items omitted below, but included in the first tabulation, such as maintenance-of-way materials, our opinion is that these should be cared for out of the railroad's regular budget. Our inspection of the property did not indicate any such degree of deferred maintenance as to require an extraordinary appropriation and we have already suggested the exchange of curve-worn rail for new rail to be purchased for the Shahrud-Meshed line and included in the cost estimate of that line.

Our estimate of the requirements is as follows:

Requirements of Railroad During Next Seven Years

	For Immediate Purchase		Total Requirements	
	Units	Dollars	Units	Dollars
Diesel locomotives ($125,000)	18	$2,250,000	30	$ 3,750,000
Passenger cars (1st & 2nd Class)	30	2,250,000	60	4,500,000
(2nd & 3rd Class)			60	1,800,000
New tank cars			127	1,080,000
Switch stands, signals, etc. and rail				2,250,000
Electrical communications, etc.		250,000		1,000,000
Machinery		500,000		1,000,000
Material and stores		2,700,000		2,700,000
New couplers on 4-axle cars				498,000
Total		$7,950,000		$18,578,000
Add for extensions				1,645,000
Total		$7,950,000		$20,223,000

Years	Amount	Purpose
First	$7,950,000	As above
Second	4,737,000	Equipment
Third	4,736,000	Equipment
Fourth	700,000	Remainder
Fifth	700,000	Remainder
Sixth	700,000	Remainder
Seventh	700,000	Remainder

Diesel Locomotives

The principal question in the procurement of new equipment is the consideration of steam versus diesel locomotives. All of the main line operation at present is with steam locomotives. The only diesels are small Davenport direct-drive locomotives used in shunting (yard) service. However, during the war, the American Army brought in 57 road diesel-electric locomotives. These were of an earlier type but nevertheless they operated satisfactorily and were primarily responsible for the movement of over twelve thousand tons of freight per day during the war. Without the speed and convenience of diesels, it would not have been possible to reach that figure without major reconstruction.

While the movement at the present time is only about one-third of the wartime peak, it could easily be doubled in the near future under a wise transportation policy, and it is foreseeable that the wartime peak will, in time, be reached and passed. When that time comes, diesel operation will avoid major reconstruction expenditure, which would otherwise be necessary.

There are two factors of Iranian Railways operation that are of particular importance in this question. In the first place, water is generally quite scarce. In fact, at some stations, it is necessary to haul water from other stations. Furthermore, much of the water is heavy with solids and is very difficult to use in locomotives. It requires heavy treatment and calls for frequent blowdowns. This means a wastage of both water and fuel.

Secondly, the railway operates on a liquid fuel basis. This means that no particularly difficult problems are encountered in the securing of diesel fuel. Actual operation at present is with oil-fired steam locomotives. Tests have shown that diesel locomotives consume only a fraction (less than one-third) of the gallonage used by oil-fired steam locomotives. From a national economy standpoint, the gallonage saved by the use of diesels instead of oil-fired steam locomotives is considerable.

It is true that a diesel locomotive is more complicated mechanically than a steam locomotive, but we believe that Iranian mechanics can be trained to maintain them. Furthermore, many of these men had extended experience in maintaining the diesel locomotives which were used during the war. This makes the development of a maintenance organization a much more simple matter. It is true that some of the personnel now engaged in maintaining steam locomotives will not be susceptible of further training, but adjustments on this account have to be made wherever diesel power is introduced.

Another factor in favor of diesel operation is the intense heat experienced in the summer in certain sections of the country. Some schedules are actually shifted from day to night in the summer to reduce the discomfort of passengers as well as engine crews in the tunnels. Diesels appreciably reduce the necessity for such a change and are otherwise more healthy for the engine crews, especially in tunnels, as they do not subject them to gases.

Diesel-electric locomotives have no reciprocating weights and are, therefore, considerably easier on the track. This is of particular importance in Iran where the rail capacity is a controlling factor. Six-wheel trucks will bring the individual wheel loads within operating limits.

In the most congested section of the railroad, between Andimishk and Dohrud, it is not practicable to increase the tonnage of trains hauled by steam locomotives by double-heading them, on account of the number and length of the tunnels. The train and engine

crews could not endure the smoke. In one place, there are 8.2 kilometers of tunnels in a space of 10 kilometers. Diesels can be articulated or coupled together and operated from the head end so that such restrictive conditions would not obtain. This permissive increase in power has further potentialities by reason of the present practice of splitting trains at Andimishk. A train from Ahwaz can have the pulling power at Andimishk doubled so that the train itself can be operated as a solid train from Ahwaz north to Tehran.

General experience with diesels shows that it is possible to operate them over long distances in continuous service. As the maximum distance is only 1,388 kilometers (Bandar Shahpur to Bandar Shah), any run in Iran can be easily made without changing locomotives. The effect of this continuous running is to increase the distance covered per day or month or year by an individual locomotive. The result is that a diesel locomotive on the Iranian railways will do the work of at least two and in some cases three steam locomotives. This means that there will be but little difference in the new money needed as between new steam locomotives and new diesel locomotives. This factor is especially important for, in most cases, the choice of diesel power over steam has been made in spite of a much higher capital cost.

The growth in the use of diesel locomotives throughout the world has been remarkable. The two largest locomotive builders in the United States are making only diesels. In fact, the production of steam locomotives in the United States has almost stopped. Other countries are also tending towards diesel power even where oil supplies are limited.

In the building of new lines, especially those crossing deserts or bad water districts, the construction is made more simple by omission of water and other facilities for servicing steam locomotives.

In summation, the advantages of diesel locomotives are these: less fuel oil, no water en route, fewer stops, longer runs, heavier loads, easier bearing on track, more comfort for passengers and crews, and general economy of operation and maintenance. The only disadvantage is that diesel power requires more skilled maintenance, but past experience shows that Iranian mechanics are fully capable of handling this type of power successfully, assuming proper training and supervision.

In the selection of specific types of diesel locomotives for service on the Iranian railways, it would be desirable, if possible, to concentrate on one type with sufficient flexibility to operate in all classes of service. The advantages are obvious. The problem of maintenance is simplified, in that mechanics can be trained to maintain one type more readily than several; the supply of replacement parts can be held to a minimum; and the total number of locomotives required can also be held to a minimum, because a locomotive not needed in one service can immediately be employed in another.

Again, the limitation of axle loads on the Iranian Railways precludes the use of the more specialized types of power designed for high tractive effort or high speeds, so that the choice is narrowed in any case.

There are in use in the United States diesel locomotives of 1,000 horsepower capacity, which will operate as slow as 14 kilometers per hour on a continuous heavy pull and as fast as 97 kilometers per hour in passenger service. The same locomotive is also well adapted to shunting operations. It is a locomotive of this general type which we would recommend for Iran.

There are two general types of diesel engine available for such locomotives, the two-cycle and the four-cycle. The two-cycle engine is lighter and more economical of fuel under certain conditions. On the other hand, the four-cycle engine operates at lower temperatures and is more economical to maintain. Both types have their advocates, but, in our opinion, the simpler maintenance problem recommends the four-cycle type for the Iranian Railways.

To comply with limitations of axle loading, it would be necessary to equip these locomotives with six-wheel trucks, as was done with the locomotives brought in by the American forces. With motors on four axles, the starting tractive effort of these locomotives would be close to 100,000 pounds.

PROPOSED RAILROAD EXTENSIONS

The three extensions of the railroad which were begun in 1317 (1938) were halted by the war in various stages of completion. On the Meshed line, the portion from Garmsar to Shahrud, 314 kilometers, had been opened for traffic and 497 kilometers more were practically completed. Some work has been done in the last year or two, and the cost of completion is currently estimated by the Ministry of Roads and Communications as follows:

	Rials
Grading, etc.	188,000,000
Ties, track laying and surfacing	97,000,000
Transport in Iran (Freight)	105,000,000
Rail and fastenings	169,000,000
Total	559,000,000

Of the above total, approximately $5,200,000 of foreign exchange will be required.

On the Tehran-Tabriz line the 439 kilometers between Tehran and Mianeh have been opened for operation and the completion of the remaining 298 kilometers has been estimated (also by the Ministry of Roads and Communications) to cost Rls. 1,226,200,000 divided as follows:

	Rials
Grading, etc.	945,000,000
Ties, track laying and surfacing	78,500,000
Transport in Iran (freight)	63,000,000
Rail and fastenings	139,700,000
Total	1,226,200,000

Of the above total, approximately $4,300,000 of foreign exchange will be required.

The projected line from Ghum to Yezd has been completed from Ghum to Kashan, 98 kilometers, and will shortly be put into operation. The remaining 378 kilometers from Kashan to Yezd is in various stages of completion, but we have obtained no current estimate of the cost of completion. An estimate made two years ago was approximately Rls. 460,000,000.

Had these railroads been conceived as profit-making enterprises, it is doubtful whether they would have gone beyond the stage of engineering reconnaissance. In spite of the large amounts which have been spent on them, the remaining amounts required for their completion are somewhat large in comparison with their prospective earnings.

As a matter of fact, the line from Kashan to Yezd has no foreseeable prospect of earning anything, and its completion is not recommended at this time.

It must be considered, therefore, that the building of these roads was a matter of public policy, and is still a matter of public policy, approved most actively by the cities which will benefit most directly, but also by the country as a whole. Such being the case, and other things being equal, the only problem would be the procurement of the necessary funds, having in mind that the projects would not be particularly attractive to private capital on the basis of present estimates of earnings.

In contemplating a Seven Year Plan for the general benefit of the whole country, we must consider the desirability of a railroad between Tabriz and Tehran, or Meshed and Tehran, in the light of the transportation requirements of the country as a whole, and if we find that the needs elsewhere are as great, then we must not discriminate against other parts of the country by devoting our attention chiefly to building these railroads.

The reason for this discussion is as follows: The total amount allocated for transportation in the Plan is Rls. 5,000,000,000, or approximately Rls. 700,000,000 a year on an average. Now, if the completion of the railroads were actively prosecuted within the limits of this Rls. 700,000,000 per year, as would seem logical under other circumstances, it would be two-and-a-half years before money would be available for any other transportation project—highway, seaport or airport. This, clearly, is not desirable.

On the other hand, it would not be practical to distribute the work on both railroads over five or seven years, since neither line can benefit its terminal city until it is completed, nor can it begin to earn any substantial return on the investment until it is completed.

A third possibility is to prosecute the completion of one of these railroads, discontinuing work on the other one until the first is completed, but still completing both sections within the period of the Plan. The question then immediately arises as to which should be undertaken first.

We have given preference to completing the road to Meshed for the following reasons:

1. If rail is promptly ordered and modern rail-laying equipment is used, this railroad should be completed in two years.
2. The cost of completing the Meshed railroad is only half as great as completing the line to Tabriz, thus leaving more money for other purposes during the earlier years.
3. It is estimated that two years will be required to complete the tunnels alone on the Tabriz line, and at least three years, and perhaps four, for the entire line.
4. If either city is to be deprived, temporarily, of having a railroad, it should be compensated by having a good highway to the capital. The improvement of the Tehran-Meshed highway is estimated to cost Rls. 180,000,000 and involves some difficult construction while the Tehran-Tabriz road can be satisfactorily improved at an estimated cost of Rls. 91,000,000, thus again making funds available for other sections and other much needed improvements elsewhere.

Incidentally, an improved highway between Tehran and Tabriz, properly protected against snow in the passes, should provide just as economical and speedy service for Tabriz and its surrounding territory as can be given by the railroad when built. This is

not to say that the absolute economy of one is as great as the other, but in the case of the highway, the maintenance and investment costs are largely borne by the state and are thus not a direct charge against the transportation of goods and passengers.

As for the completion of the railroad between Kashan and Yezd, we believe that further consideration of this project should be deferred until the prospects of traffic over it become considerably brighter. We have heard no claim that it could earn its operating expenses, and our own observation of the country and the traffic along the roads give no reason to think that it could. In a country where transportation costs are necessarily high, the creation of uneconomic transportation is particularly vicious, penalizing the whole community for the benefit (in this case) of a very few.

The expenditures for railroads in the Seven Year Plan are shown in Exhibit H-9.

ROADS

GENERAL

Practically all the roads of Iran require reconstruction or new construction in greater or less degree to provide the easy and economical transport of goods and passengers between distant points which is essential to the economic development of the country. In view of this fact, and the further facts that the funds provided for this purpose are not great and that their expenditure must be spread over several years, the problem becomes one of priorities.

In attempting to solve this problem, we have considered three principal factors. First, the importance of the road itself, in terms of the communities served or interconnected; second, the present condition of the road as we observed it; and third, the availability of another means of transport, that is to say, a railroad. Another consideration, of course, was geographical, in that one section should not be unduly favored over others. Put more briefly, we attempted to give priority to the projects which would produce the greatest good for the greatest number.

The funds allocated under the Seven Year Plan were apparently based on an estimate prepared by the Ministry of Roads and Communications embracing 22 projects. As a result of our inspection, we are in accord with this list except that we have added one more, namely, the road from Isfahan east to Naiin. On the other hand, as a result of our inspection, we seriously questioned the adequacy of the amounts assigned to certain of the projects, and these estimates have been increased. No surveys had been made of these projects to determine the quantity of earth to be moved, or the number or size of bridges, so that our estimates are necessarily based on judgment, guided by an inspection of the actual costs of reasonably similar work. The revision of these estimates and the inclusion of an additional project brings the total to an amount in excess of the appropriation. On the other hand, we are recommending against the completion of the railroad from Kashan to Yezd within the scope of the Plan, so that the total for transportation will still fall within Rls. 5,000,000,000.

The highway projects recommended are shown on the map, Exhibit H-1.

With due regard to the funds provided and also to the present and prospective density of the traffic, we believe that first-class arterial highways should conform to these general specifications:

> Width of roadway should be eight meters, with surface of water-bound macadam, six meters wide. (It is contemplated that after time for settlement, an asphalt surface would be applied. Funds for this purpose are being

accumulated through a special gasoline tax.) In open country the minimum radius of curvature should be 300 meters, and the maximum gradient five per cent. The radius of vertical curves should be not less than 150 meters. In mountainous country where speeds must be restricted in any case, the maximum grade should not exceed seven per cent (for relatively short distances) and the minimum radius of horizontal curves should not be less than 30 meters. Where roads have been subjected to washing, as have large portions of the road between Ghum and Isfahan, sufficient embankments, culverts and ditches should be provided to reduce the probability of a recurrence.

In order not to necessitate large expenditures for construction of bridges, we recommend that the maximum weight of vehicles and lading be regulated by law and that machinery for enforcement be set up.

ROAD BUILDING MACHINERY

There is little or no road building machinery now in Iran, and construction is done by hand methods which are time consuming and costly. Such machinery must be available from some source in order to obtain the greatest values for construction expenditures and to release labor which will be necessary for other and more profitable activities contemplated under the Seven Year Plan.

On the assumption that the work will be done by government forces or let to Iranian contractors who have no such equipment, we recommend that orders be placed as promptly as possible for road-building machinery in approximate amount of Rls. 65,000,000 or $2,000,000, for all of which foreign exchange will be required. A tentative list of heavy road-building machinery follows:

	Unit Cost	Total
10—Heavy bulldozers, similar to Caterpillar No. 8	$18,000	$ 180,000
10—Medium bulldozers, similar to Caterpillar No. 6	10,800	108,000
90—5 to 7½ ton dump trucks	6,600	594,000
15—Motor graders, similar to Caterpillar No. 12	14,000	210,000
15—Grader elevators	6,500	97,500
15—Portable rock crushers, 25 to 30 tons per hour	8,000	120,000
15—Road rollers, 8 to 12 ton	8,000	120,000
15—General purpose 1½ to 2 ton trucks	3,600	54,000
10—Mobile air compressors, 20 cmm	4,500	45,000
2—Liquid asphalt sprayers, 1000 gallon tank	10,000	20,000
Spare parts for above		200,000
Miscellaneous material and equipment such as rail, ties and small cars for tunnel work, wheelbarrows, picks, shovels, dynamite, etc.		251,500
Total		$2,000,000
Equivalent Rials		65,000,000

The above list of road-building machinery will equip fifteen construction crews or contractors with the necessary tools.

If foreign contractors are awarded some part of the work, it may be possible to reduce the amount of machinery to be purchased.

RECOMMENDED ROAD PROJECTS IN APPROXIMATE ORDER OF PRIORITY

No. 1—Kermanshah, Sanandaj, Miandoab, Tabriz **Rls. 141,000,000**

There is general agreement that this project should have first priority. It affords a direct route from the Hamadan-Kermanshah district to Tabriz and the very important Azarbaijan district, shortening the present route via Takestan, Zenjan and Mianeh by some 150 kilometers. There is an oil refinery at Kermanshah, with a capacity of 100,000 tons per year, which supplies the Azarbaijan district with most of its petrol and fuel oil requirements. At present these supplies have to be trucked over the round-about route, which frequently has been blocked by snow drifts and washouts from 30 to 40 days at a time. It is also proposed that the new road should be so constructed that it can easily be kept open the year around.

No. 2—Tehran, Ghum, Isfahan, Shiraz, Bushire **Rls. 239,000,000**

There is an urgent need for this primary highway from Tehran to the Persian Gulf, easterly of the Zagros mountains and connecting the important cities of Ghum, Isfahan, Shiraz and Bushire. Isfahan is one of Iran's largest cities and also one of its most productive ones. It has no railroad, and, therefore, should have a first-class highway to Tehran. Its only present access to the Persian Gulf ports is by an indirect route, and this is an impediment to its commerce.

We are recommending the improvement of the port of Bushire, but in order for the port to function adequately, the road from Bushire to Shiraz must be relocated in part and greatly improved. Finally, the improvement of the section from Shiraz to Isfahan will give the latter city another and shorter route to the Gulf.

The road from Tehran to Ghum is already paved with asphalt, and it is very heavily travelled. This pavement needs some urgent repairs and improvements, and this work has been started. From Ghum to Isfahan and on to Shiraz, numerous changes in alignment and grades are needed; widening of roadbed in places; and roadbed drainage and culverts. From Shiraz to Bushire, one major and several minor relocations are necessary, before the road is macadamized.

No. 3—Takestan, Zenjan, Mianeh, Tabriz **Rls. 91,000,000**

This highway was macadamized once, but extensive usage without sufficient maintenance has worn away all signs of pavement in a great many places and for long stretches. It should be repaved with a water-bound macadam at an early date, but before this is done extensive revisions of line and grades should be made. The highway over Shibli Pass should be relocated for a distance of about twelve kilometers so as to eliminate several sharp curves and steep grades. Extensive roadside ditching and numerous culverts are required. All cuts across the Mianeh-Rastamabad plateau should be protected by snow barriers of rock fences or dug trenches along the windward side of the roadway.

This is the principal highway between Tehran and Tabriz and the Azarbaijan district, and it is heavily travelled. On one trip we met 36 buses and 151 trucks, and on the return 41 buses and 187 trucks. During the past winter it was closed by snow drifts and washouts for 40 days. Its importance to the communities it serves warrants the prompt construction of a primary highway which can be kept open at all times.

No. 4—Isfahan, Dumbena, Azna **Rls. 36,600,000**

The purpose of this road is to furnish a better connection between Isfahan and the railroad for movement to and from the ports. This is highly desirable because of the aforesaid circuity of movement now necessary.

This road was authorized several years ago, and we are advised that most of the grading is done and most of the bridges built. In anticipation of completion of the road, the Anglo-Iranian Oil Company built storage tanks at Azna for distribution of its products to Isfahan and east. The saving on this movement alone would be substantial. Completion of the road will also improve communication between Isfahan and the Kermanshah district.

No. 5—Zenjan, Bijar, Divan Darreh **Rls. 72,000,000**

This project provides for the completion of the new construction work between Zenjan and Bijar begun last year; also the reconstruction and improvement of the highway between Bijar and Divan Darreh, as well as the construction of a new bridge over the Zenjan River just outside of Zenjan.

This road will afford a convenient outlet for the products of the very fertile valley along the upper regions of the Quigil Ugun River which now has only camel tracks. Secondarily, it will serve as a short cut from the proposed new road from Kermanshah to Tabriz (Project No. 1) and the Zenjan-Mianeh district. It is a much needed highway extension.

No. 6—Tehran, Karaj, Chalus **Rls. 30,200,000**

This is the shortest route from Tehran across the Elborz Mountains to the Caspian Sea littoral. It is a very important highway, heavily travelled for nine months each year, but generally impassable during the winter months on account of snow drifts and snow slides. During the past season it was closed for 114 days.

It is proposed to ease several of the sharp curves and steep grades, build several additional snow sheds near the summit, and repair the Kandoran Tunnel at the summit. Provision should be made through the Maintenance Department, or otherwise, to purchase one rotary snow plow and keep it stationed near the summit, as well as to equip several heavy dump trucks, during the winter months, with angling blades for snow removal. This highway, on account of its importance, should be kept open the year around.

No. 7—Kazvin, Kuhlin Pass, Resht, Pahlevi **Rls. 42,500,000**

This project would materially improve that section of the Tehran-Resht-Pahlevi road from Kazvin over the Kuhlin Pass to Margil; through the Sefid Rud to Imamzadeh-Hashem and then on to Resht and Pahlevi. This road serves the cities of Resht and Pahlevi and the very important southwest section of the Caspian Sea littoral. It is well travelled through all seasons of the year, but is frequently closed for many days at a time during the winter and spring seasons by snow drifts, rock slides and washouts. Several sections of it were paved with asphalt in 1321 and 1322 (1942 and 1943) by the Allies, but much of that pavement has to be replaced on account of inadequate maintenance. It is proposed to make this a primary highway which can be kept open through all seasons.

No. 8—Khorram-abad, Harsin, Kermanshah **Rls. 26,700,000**

Khorram-abad is on the main road to Ahwaz, and this road, together with the new road from Tabriz to Kermanshah, will shorten the distance from Tabriz to Ahwaz and Khorram-shahr by 220 kilometers. It will also improve the connection between the Kermanshah district and the ports.

No. 9—Trans-Northern Road—Tabakan, Meshed, Quchan, Bujnurd, Bandar Shah
Rls. 153,100,000

This is at present a very poor road serving the fertile Gurgan plain and other fertile districts farther east. It assumes new importance because of our belief that the Gurgan plain has 1,750,000 acres capable of wheat production, which, on a three year rotation and at 15 bushels per acre, would produce approximately 9,000,000 bushels per year. Improving the road to Bandar Shah gives access to the railroad for this grain. The produce of the eastern portions would flow, naturally, to Meshed.

Politically and socially, the improvement of this road is desirable, as the towns and villages of the district are shut off from the remainder of the country throughout the winter, and thus more exposed to Russian influence than Iranian. The military establishment also needs the road to link its border patrols.

No. 10—Ghum, Kashan, Yezd, Kerman, Bandar Abbass **Rls. 254,300,000**

This is the main road from Tehran to the southeastern portion of the country and the Persian Gulf port of Bandar Abbass, but since the railroad is now completed to Kashan, it is proposed to give priority to that portion of it from Kashan south, and at the same time make this route through Isfahan the principal highway connection between Yezd, Kerman, Bandar Abbass and the capital. This is a logical solution, since Isfahan is an important intermediate market and business place for traffic moving between Tehran and the southeast and in the opposite direction. It is anticipated that with an improved road, traffic through the port of Bandar Abbass would come as far inland as Yezd. The strategic value of this road is also stressed by the military.

No. 11—Tehran, Firuzkuh, Shahi **Rls. 35,700,000**

This is the primary highway from Tehran to the southeast section of the Caspian Sea littoral. It is somewhat longer than the Chalus road (238 kilometers as compared with 193 kilometers) but it has the advantage of going over more open country across the Elborz plateau, and, therefore, is not subject to such serious snow drifts and snow slides. However, it has two long stretches of side-hill location, following through two ravines, which have numerous sharp curves and steep grades. The highway must be relocated through these ravines so as to afford safe grades and curves. Several new culverts are also needed to guard against washouts. This is a heavily travelled road at present, serving a substantially developed area in the Caspian Sea littoral some 150 to 250 kilometers east of the area served by the Chalus road.

It seems probable, however, that much of the present traffic has been diverted to the highway by the inadequacy of the railroad service.

No. 12—Tehran, Shahrud, Meshed **Rls. 180,000,000**

The highway from Tehran to Meshed is one of Iran's most important roads but its importance as a through-route will be materially decreased with the completion of the railroad to Meshed which is planned for the earliest practicable date. Throughout most of its length it lies at the base of the southern slope of the Elborz Mountain chain and is subject to many washouts. To rebuild it in its present location would call for very expensive protection against seasonal floods and it is, therefore, proposed that extensive study should be made to secure a more advantageous location. In the meantime, funds available through the maintenance budget should be used to keep the road passable.

No. 13—Mohan, Ardebil, Gulan **Rls. 76,000,000**

This is to be a second-class macadamized road through a large agricultural area in the Azarbaijan Province, which at present has no dependable road connections with other towns and villages in that province. It is to start at the Iran-U. S. S. R. border town of Belyasuvar, thence southwesterly through the Savikamish Valley to the headwaters of the Qarain River, thence on to Ardebil, Firuzabad, Fumen and Resht, where it will connect with the Resht-Tehran highway; and with an extension from Firuzabad to Mianeh, where it will connect with the Tabriz-Tehran highway. This project is considered very desirable from a military standpoint as well as from an agricultural point of view.

No. 14—Meshed, Zahidan, Chahbahar **Rls. 281,000,000**

This project covers the improvement of the present highway between Meshed and Zahidan; the reconstruction of the road between Zahidan and Bampur, and the construction of a new road from Bampur to Chahbahar on the Arabian Sea, near the Baluchistan border. When completed, it will be a primary north-south highway, some 1,660 kilometers long and generally paralleling Iran's eastern border, but many kilometers inland. This is not a heavily populated region, but the road is considered important by the military authorities, and there is some agricultural production.

If and when the port of Chahbahar is developed, this road will give Meshed, and the agricultural district tributary to it, a shorter route to the sea.

No. 15—Behbehan to Shiraz—Bushire Road **Rls. 52,500,000**

This project consists of the construction of a new road from the Agha-Jari oil field to the proposed new road between Shiraz and Bushire. It will be a very important link from the Ahwaz, Abadan, and Khorram-shahr industrial areas to the tributary agricultural country. This road also traverses an area which our agricultural advisers believe to have great potentialities for subtropical crops.

No. 16—The South Coastal Road **Rls. 92,400,000**

This is to be a second-class macadamized road along the Persian Gulf Coast between Bushire and Bandar Abbass via Dayes, Asalu and Lingeh. Some of these areas are not now accessible for vehicular traffic.

The population is small, as this coastal area has very little rainfall, but the road is important for costal patrol against smugglers.

No. 17—The Haraz River Road **Rls. 164,000,000**

This project provides for the completion of an additional highway between Tehran and the central (Amul, Babul and Babulsar) section of the Caspian Sea littoral, which was begun by the late Rez Shah Pahlevi in 1320 but was stopped in 1321 (1942) when the Russians occupied that section. When completed, it will be the shortest route between Tehran and the central area of the Caspian Sea littoral. It will cross the Elborz Mountains at an elevation about the same as the Chalus road, but will not be subject to the extensive snow drifts and slides of the latter, because it crosses the summit in open country which is free from those hazards. It will shorten the distance from the area of its northern terminal to Tehran by approximately 100 kilometers. That area is very fertile and produces much of the fresh vegetables and other agricultural products for Tehran and adjoining towns.

No. 18—Tehran, Saveh, Nubaran, Rovan **Rls. 47,000,000**

This project was begun more than a year ago, and for about one-third of the distance the roadbed has been graded and the culverts built. It will serve a well-settled area from the southwest of Tehran to Saveh and beyond—a distance of some 130 kilometers. The extension from Saveh to Nubaran and Rovan not only furnishes an outlet for those towns and other villages, but it will also be a very convenient short cut to the principal north-south asphalt-paved highway through Hamadan, Malayer, Burujird, and Ahwaz to Khorram-shahr, thereby obviating the necessity of travelers coming into Tehran before starting on a southward journey.

No. 19—Ghum, Arak, Burujird **Rls. 34,500,000**

This is a project for the improvement of the existing road between Ghum, Arak and Toreh, and the construction of a new road (45 kilometers) from Toreh to Burujird, there to connect with the principal north-south paved road from Ahwaz to Kazvin and Tehran. Its completion will not only insure a passable road through this area in all seasons of the year, but it will effectively knit together the Hamadan-Burujird area with the Ghum-Kashan area, materially shortening this distance between these two important districts.

No. 20—Yangikom, Tabok, Miandoab **Rls. 42,000,000**

With the construction of the new road from Zenjan to Bijar (Project No. 5) it becomes desirable to build another road from a village on that road known as Yangikom to Tabok, and to improve the present road from Tabok to Miandoab. This road will further open up the large agricultural area along the upper reaches of the Qizil Uzun River and its several tributaries. It will give the people of this section a convenient highway to Azarbaijan Province via Miandoab and Tabriz, and to the south via Miandoab, Sanandaj and Kermanshah.

No. 21—Isfahan, Lurdajan, Ram Hormuz, Ahwaz **Rls. 204,000,000**

This will be a new road, the first direct one between Isfahan and Ahwaz. It will not only materially reduce the distance between these two important cities, but it will also open up a large mountain region, occupied by numerous tribes, which is not now accessible except by caravan. It is desirable politically that a closer contact with this

area and its people should be established. The road will also provide a new outlet for the fruits and vegetables of Isfahan, particularly in the Abadan area where a ready market will be found for them.

No. 22—Kerman to Shiraz via Rafsinjan and Abbas-abad **Rls. 60,000,000**

This is a decided short cut between two principal highways—one going from Isfahan to Shiraz and the other from Yezd to Kerman. People wishing to go from Shiraz to Kerman or vice versa now have to go via Isfahan, Naiin and Yezd. This new road will shorten the distance of travel by more than 500 kilometers. It is also regarded as a very desirable improvement by the military.

Total of above projects	Rls. 2,355,500,000
Machinery (page 25)	65,000,000
Grand Total—Roads	Rls. 2,420,500,000

The recommended construction program for these projects is set forth in the schedule, Exhibit H-3. A map showing the projects by the numbers assigned to them above is marked Exhibit H-1. Following is a summary of the foregoing projects showing the character of the work proposed on each of the sections and an estimate of the cost.

SUMMARY OF ROAD PROJECTS

	Kilometers	Approximate Rials Per Kilometer	Rials
No. 1—Kermanshah, Sanandaj, Miandoab, Tabriz			
A—Kermanshah-Sanandaj ..... (Line revisions; roadbed improvements and culverts)	160	150,000	25,000,000
B—Sanandaj-Miandoab ..... (Extension, reconstruction, new bridges, etc.)	300	300,000	90,000,000
C—Miandoab-Tabriz ..... (Line revisions; widening roadbed, culverts, etc.)	176	150,000	26,000,000
Total	636		141,000,000
No. 2—Tehran, Ghum, Isfahan, Shiraz, Bushire			
A—Qum-Salifjan-Neyzar-Isfahan ..... (Extension line revisions; roadbed improvements and culverts, etc.)	273	200,000	55,000,000
B—Isfahan-Abadeh-Shiraz ..... (Line revisions; roadbed improvements, culverts, etc.)	424	175,000	75,000,000
C—Shiraz-Dasht Arjan ..... (Line revisions; roadbed improvements, culverts, etc.)	67	200,000	13,000,000
D—Dasht Arjan-Borazjan ..... (Major relocations, roadbed improvements, bridges, etc.)	220	400,000	88,000,000
E—Borazjan-Bushire ..... (Minor line revisions, roadbed improvements, culverts, etc.)	66	120,000	8,000,000
Total	1,050		239,000,000

	Kilometers	Approximate Rials Per Kilometer	Rials
No. 3—Takestan, Zenjan, Mianeh, Tabriz	454	200,000	91,000,000
(Extensive roadside ditching; culverts; snow barriers, such as rock fences or trenches along windward side of highway between Takestan and Zenjan; additional crushed stone or gravel on roadbed. Between Zenjan and Mianeh, several line and grade revisions, roadbed elevation and culverts. Between Mianeh and Tabriz extensive line and grade revisions, roadbed elevations, culverts, snow barriers, relocation of highway over Shibli Pass, thereby eliminating twelve hairpin curves and several steep and dangerous grades.)			
No. 4—Isfahan, Dumbena, Azna	244	150,000	36,600,000
(Complete the new construction of this road which was begun over a year ago and is well advanced; new bridges and culverts for all streams; protect new roadbed by necessary drain ditches wherever water accumulates; macadamize roadbed with a topping of crushed stone or gravel.)			
No. 5—Zenjan, Bijar, Divan Darreh			
A—(Complete the new construction work started last year between Zenjan and Bijar; new bridge over the Zenjan River; bridge all streams, protect new roadbed by necessary drain ditches; macadamize roadbed with crushed stone or gravel.)	130	400,000	52,000,000
B—(Reconstruct highway between Bijar and Divan Darreh—there to connect with the new primary highway from Kermanshah to Tabriz.)	80	250,000	20,000,000
Total	210		72,000,000
No. 6—Tehran, Karaj, Chalus	151	200,000	30,200,000
(Clear up numerous rock slides through the Karaj River canyon, revise several sharp curves and grades, additional snow sheds near the summit, complete repairs to the Kandoran Tunnel; several line revisions and grade improvements required on the Chalus side of the mountain range. Acquire one rotary snow plow for use in winter time to keep highway clear near the Kandoran Tunnel.)			
No. 7—Kazvin, Kuhlin Pass, Resht, Pahlevi			
A—Kazvin-Kuhlin Pass	32	100,000	3,000,000
(Repair asphalt paving; construct culverts, drain roadbed; erect snow barriers.)			

	Kilometers	Approximate Rials Per Kilometer	Rials
B—Kuhlin Pass-Imamzadeh-Hashem ..... (Reduce curves on dugway; improve grades; culvert washes; remove rock slides; prepare for paving.)	154	200,000	30,800,000
C—Imamzadeh-Hashem-Resht ..... (Improve alignment and grade of roadbed; construct culverts, prepare for paving.)	35	150,000	5,200,000
D—Resht-Pahlevi ..... (Prepare roadbed for repaving.)	35	100,000	3,500,000
Total	256		42,500,000
No. 8—Khorram-abad, Harsin, Kermanshah ..... (Improve general alignment, reduce curves, widen roadbed; construct bridges and culverts, preparatory to paving with asphalt. This road will be a shortcut from the Ahwaz, Andimishk, Khorram-abad district to the Kermanshah district—reducing the distance by at least 220 km.)	178	150,000	26,700,000
No. 9—Trans-Northern Road—Tabakan, Meshed, Quchan, Bujnurd, Bandar Shah			
A—Tabakan-Meshed-Quchan ..... (Line revisions, grade reductions, culverts, roadbed improvements, etc.)	198	150,000	29,700,000
B—Quchan-Bujnurd ..... (Major improvements and repairs, bridges, culverts, additional macadam.)	140	200,000	28,000,000
C—Bujnurd-Gombadabos-Gorgan ..... (Major line and grade revisions; new construction, bridges, culverts and additional macadam.)	407	200,000	81,400,000
D—Turkish Frontier-Maku-Khoy	140	100,000	14,000,000
Total	885		153,100,000
No. 10—Ghum, Kashan, Yezd, Kerman, Bandar Abbass			
A—Ghum-Kashan ..... (Improve alignment, widen roadbed, culverts.)	96	200,000	19,200,000
B—Kashan-Natanz-Ardestan-Naiin ..... (Reduce curves and grades, construct culverts.)	246	200,000	49,200,000
C—Naiin-Yezd-Kerman ..... (Widen roadbed in places; protect roadbed from drifting sand; culverts.)	555	100,000	55,500,000

	Kilometers	Approximate Rials Per Kilometer	Rials
D—Rafsinjan-Sirjan-Bandar Abbass ..... (Construct new line in part between Rafsinjan and Sirjan; improve balance by reducing curves and grades; construct bridges and culverts, widen roadbed in many places.)	493	200,000	98,600,000
E—Isfahan-Naiin ..... (Improve alignment and gradient where needed, widen roadbed, culverts.)	159	200,000	31,800,000
Total	1,549		254,300,000
No. 11—Tehran, Firuzkuh, Shahi ..... (Continue improvement of lines and grades; culvert all washes, drain roadbed wherever water stands; rebuild dugways between Jaboon and Firuzkuh, and again between Gadouk and Pul-i-Sefid. Both of these dugways have several sharp curves and steep grades, and they are not safe for wet weather driving.)	238	150,000	35,700,000
No. 12—Tehran, Shahrud, Meshed			
A—Tehran-Veramin ..... (Minor line revisions, roadbed improvements, etc.)	30	100,000	3,000,000
B—Veramin-Garmsar ..... (Major line revisions, roadbed improvements, culverts, etc.)	74	200,000	15,000,000
C—Garmsar-Samnan ..... (Major roadbed improvements, culverts, etc.)	117	170,000	20,000,000
D—Samnan-Shahrud-Miameh ..... (Line revisions, roadbed improvements, culverts, etc.)	241	200,000	48,000,000
E—Miameh-Kahash ..... (Major line revisions, roadbed improvements, culverts, etc.)	108	250,000	27,000,000
F—Kahash-Meshed	334	200,000	67,000,000
Total	904		180,000,000
No. 13—Mohan, Ardebil, Gulan			
A—Belyasuvar-Ardebil-Firuzabad ..... (New construction—2nd class.)	270	150,000	40,500,000
B—Firuzabad-Mianeh ..... (Improve roadbed, culvert washes, etc.)	90	100,000	9,000,000
C—Firuzabad-Heran ..... (Improve roadbed, culvert washes, etc.)	40	100,000	4,000,000
D—Heran-Massule-Fumen ..... (New construction—2nd class.)	150	150,000	22,500,000
Total	550		76,000,000

	Kilometers	Approximate Rials Per Kilometer	Rials
No. 14—Meshed, Zahidan, Chahbahar			
A—Junction of Tehran—Meshed road to Zahidan ..... (Improve roadbed, reduce certain curves and grades, culvert several washes, protect highway from drifting sands, etc.)	897	100,000	89,700,000
B—Zahidan-Kash-Iranshahr-Chahbahar ..... (Major line revisions and relocations of roadbed now in creek bottoms; reduce grades, construct bridges and culverts, macadamize roadbed.)	765	250,000	191,300,000
Total	1,662		281,000,000
No. 15—Behbehan to Shiraz—Bushire Road	210	250,000	52,500,000
A—Construct a new road from the Agha-Jari oil field to connect with Shiraz-Bushire road near Kazerun. (Major new construction work, new bridges, culverts, roadside drains, macadam.)			
No. 16—The South Coastal Road			
A—Bushire-Deyer-Asalu-Lingeh-Bandar Abbass ..... (Minor changes in line and grades, bridges and culverts so as to provide a second class highway along the Persian Gulf coast to be used primarily for military and coastal inspection services.)	616	150,000	92,400,000
No. 17—The Haraz River Road			
A—Complete the construction of the road, bridges and tunnels from the junction of the Tehran-Firuzkuh road at Rudehen to Amul.	153		164,000,000
No. 18—Tehran, Saveh, Nubaran, Rovan			
A—Complete construction between Tehran and Saveh ..... (Additional grading, ditching, culverts and macadam.)	130	100,000	13,000,000
B—Saveh-Nubaran-Rovan ..... (New construction, grading, ditching, bridges, culverts, macadam.)	136	250,000	34,000,000
Total	266		47,000,000

	Kilometers	Approximate Rials Per Kilometer	Rials
No. 19—Ghum, Arak, Burujird			
A—Ghum-Arak ..... (Repair and improve road, line changes, roadbed improvements, culverts, macadam.)	175	120,000	21,000,000
B—Toreh-Burujird ..... (New construction, bridges, ditches, culverts, macadam.)	45	300,000	13,500,000
Total	220		34,500,000
No. 20—Yangikom, Tabak, Miandoab			
A—Yangikom-Tabak ..... (New roadbed, bridges, culverts, ditches, macadam.)	90	250,000	22,500,000
B—Tabak-Miandoab ..... (Major revisions of line and grade, culverts, macadam.)	130	150,000	19,500,000
Total	220		42,000,000
No. 21—Isfahan, Lurdajan, Ram Hormoz, Ahwaz ..... A—Construct an entirely new road across the mountains between Isfahan and Ahwaz for the purpose of shortening the present travel distance between these two important cities, and to open up a large section of Iran not now accessible.	510	400,000	204,000,000
No. 22—Kerman-Shiraz via Rafsinjan and Abbas-abad ... A—Construct a new highway between the Yezd-Kerman road and the Shiraz-Isfahan road so as to shorten the travel distance between Bushire, Shiraz and Kerman.	300	200,000	60,000,000
Grand Total	11,462		2,355,500,000

SEAPORTS

GENERAL OBJECTIVE OF PLAN FOR SEAPORTS

Port development as part of the Seven Year Plan must keep pace with the increasing tonnage that will pass through the seaports of Iran as the execution of the Plan advances. An annual tonnage of 5,000,000 is envisaged ultimately for the Persian Gulf ports, but this figure could not be approached within the present Seven Year Plan. The ultimate annual tonnage through the ports is expected to move as follows:

Khorram-shahr	500,000
Bandar Shahpur	1,000,000
Bushire (or Asalu)	500,000
Ghishm Island	1,000,000
Chahbahar	1,000,000
Small ports	1,000,000
Total	5,000,000

The great bulk of the overseas trade of Iran now passes through Khorram-shahr and Bandar Shahpur. The existing working capacity of these ports, as at present operated, is insufficient to deal with the current trade which amounts to about 450,000 tons yearly.

The yearly import of steel rails, locomotives and other materials and equipment and plant for the Seven Year Plan demands an immediate increase in port working capacity to deal with an expected yearly tonnage of 800,000.

Two major problems respecting port conditions require solution. First, at the port of Khorram-shahr, where most of the commercial imports exports of Iran are handled, a state of emergency exists. The port is badly congested with cargo, ship discharge is almost at a standstill, and the dispatch of cargo from ship to consignee is seriously delayed. Complaints have been made for some years of the inefficient organization, inadequate equipment, and the difficulty of obtaining railroad and road clearance of cargo from this port. The recent floods in that region cut railroad and road communication. No relief can be given by water transport because there is no lighterage service to Ahwaz up the Karum River. Conditions at Bandar Shahpur are also bad and will deteriorate quickly as ships are diverted from Khorram-shahr.

Secondly, the absorption of almost the whole of the overseas trade of Iran by the ports of Khorram-shahr and Bandar Shahpur has resulted in the serious decline of the ports of Bushire, Bandar Abbass and Lingeh. Traffic now passes to and from the provinces of Fars and Kerman from and to the sea via Tehran or Ghum instead of via the nearest port. The state of the roads to the southern ports has contributed to their decline. The draining away of population from this coast is serious, and reasonable measures must be taken to rectify the situation.

Exhibit H-4 shows the tonnage of cargo handled through the principal seaports of Iran (except the oil ports of the Anglo-Iranian Oil Company). Exhibit H-2 shows the location of these ports.

Owing to the state of trade relations between Iran and the Soviet Union, shipping traffic between the two countries (except for the fishing industry) has ceased. No immediate problem, therefore, arises, but a future possible revival of trade through this route to the North and to Europe must be borne in mind.

Looking far beyond the present Seven Year Plan, it is envisaged that deepwater ports to accommodate ocean-going vessels and afford berthing facilities alongside the quays may be needed. This problem must be considered, but has no urgency.

The tentative allocation of money for the Seven Year Plan for port development is Rls. 250,000,000. This sum would not do more than enable badly needed arrears of maintenance to be restored, technical education and training of Iranian personnel to be commenced, a port and inland waterways administration to be set up, certain urgently needed improvements to be made in some ports on the Persian Gulf, and studies for future long-term port development to be started.

No money remains for the setting up of a properly equipped Marine Department for the Persian Gulf ports. The present reliance by the Iranian Government on the Basra Port Directorate and the Anglo-Iranian Oil Company for care of sea approaches, lights, buoys and dredging is unsatisfactory.

If private companies could be induced to take over the active ports of the Persian Gulf in their present condition, develop them to handle the anticipated increased tonnage, and operate them on terms satisfactory to the Iranian Government, the cost of the development of any port or ports taken over would not come out of the funds allocated to the Seven Year Plan. Such sums should be released towards the setting up and equipment of a Marine Department for the Persian Gulf.

PRESENT OPERATING CONDITION OF SEAPORTS

A state of emergency exists in the Persian Gulf ports of Khorram-shahr and Bandar Shahpur. Khorram-shahr is practically stopped and Bandar Shahpur is unable to deal efficiently with the vessels diverted from Khorram-shahr. Ships are now waiting to go alongside the jetties. The situation is very serious and immediate emergency measures are necessary.

Bushire is almost idle. The port can handle more transit traffic but the warehouses must not, in that event, be used for storage or the port will quickly become choked.

Lingeh is almost dead and cannot handle more than local trade.

Bandar Abbass is idle. The Customs warehouses contain some 6,000 tons of sugar and no important tonnage could be put through the port unless the Customs warehouses were used purely as transit sheds and not for storage.

Caspian ports are idle and no tonnage is in prospect. Until some dredging is done, no considerable tonnages could be dealt with.

PRESENT GENERAL ORGANIZATION AND ADMINISTRATION OF PORTS

One of the reasons for the present emergency at Khorram-shahr and Bandar Shahpur is that there is no unification of control in these ports. The result is that conflicting orders are given, friction arises and general frustration and confusion exists.

The present situation in respect of general organization and administration and operation of the ports in Iran is set out in Exhibit H-5.

It will be seen that there is no uniformity. There is duplication of functions and waste of effort and money. The present confused state arises from the time when a Customs administration was built up in Iran. This situation cannot be allowed to continue if the ports are to function efficiently.

RECOMMENDATIONS FOR DEALING WITH THE EMERGENCY AT KHORRAM-SHAHR AND BANDAR SHAHPUR

The effects of the emergency at Khorram-shahr and Bandar Shahpur on the handling of imports into the country are so serious that it is essential that all immediate practicable steps be taken to overcome them and to put these ports into a position to deal with the tonnage imported through them.

In an attempt to bring about relief of the situation as quickly as possible, the Director-General of Customs, independent of the Plan Organization, has sought the advice of a Dutch port expert, Mr. C. G. Meerburg, for immediate remedial measures. When Mr. Meerburg's engagement became known to us we took steps to insure that his investigation be carried out in co-operation with OCI so that the mutual advantages of consultation would be realized and, more importantly, so that his recommendations to meet the

emergency situation would give recognition to the work which OCI was doing, not only for the immediate problem but also for the longer range problem of the development of the ports for continued efficient operation. Mr. Meerburg has submitted his recommendations, which we have reviewed, and, insofar as they deal with the recommendations for immediate emergency measures, we concur with his findings.

Mr. Meerburg's report and recommendations for dealing with the immediate situation went to the Director-General of Customs on the 18th of May, 1949 (28 Ordibehesht 1328). It is hoped that action has been taken along the lines of Mr. Meerburg's recommendations for the emergency situation which, in summary, were as follows:

1. That an order, temporarily prohibiting the landing of goods at Khorram-shahr, be issued.
2. That a Kuzistan Ports Regulating Committee be set up.
3. That a river transport on the Karun River be promoted.
4. That merchants be notified that all goods at Khorram-shahr which are not cleared through Customs and delivered within three months from the date of landing will be officially removed to Ahwaz.
5. That arrangements be made for the immediate use of the wharf at Feleijeh Creek for discharge from barges of iron and other bulky and awkward cargoes.
6. That the handling of cargo at the ports be transferred from the Customs Administration to the Iranian State Railways, which should set up a special Port Management branch and engage foreign experts to serve as Port Managers for the initial period.
7. That the intake of cargo at the ports be controlled so as not to exceed the clearance capacity of the ports, so long as the ability of the Iranian State Railways to clear the traffic and the condition of roads has not been sufficiently improved to provide ample transportation into the interior for all cargo that could be landed.
8. That merchants should be induced to remove cargo quickly from the ports by a sharp increase in rates charged for storage.

Mr. Meerburg also made certain recommendations for additional switching locomotives, mechanical equipment and storage accommodations, etc. These are dealt with in the general recommendations for port development in this report, as they cannot be immediately implemented.

GENERAL RECOMMENDATIONS

Deferred Maintenance of Ports

The port installations generally (except the Customs warehouses), the floating plant and the equipment of the Persian Gulf ports have been neglected. Urgent need of attention to buoys and lights and to the dredging of the ports and sea approaches and channels exists.

The port working capacity essential to the successful progress of the Seven Year Plan will not be available until certain repairs and dredging work are carried out. Special mention must be made of the urgent need for dredging at Khorram-shahr.

The Caspian seaports do not present such an urgent problem, but dredging should be commenced as soon as practical, and to do this a floating dredging plant of the General Ports Department must be put in good order.

It is, therefore, recommended that a sum of Rls. 20,000,000, including Rls. 16,000,000 of foreign exchange, be expended over the years 1328, 1329, 1330 and 1331.

The total sum is probably inadequate, and annual budget grants, for maintenance purposes should be generous.

Education and Training of Iranians

The institution of a modern Port Administration in Iran, as recommended later in this report, will need the services and advice of foreign experts in the initial stages.

The Port Administration should train Iranian personnel to replace these men as quickly as practicable. Therefore, it is strongly recommended that a sum of Rls. 10,000,000 be expended on education and training of suitable Iranians in port duties. The expenditure would be in the years 1329-1334 and it is estimated that foreign exchange would be needed in the amount of Rls. 10,000,000.

Development of Persian Gulf Ports

To ensure a practicable port working capacity of at least 800,000 tons per annum in Persian Gulf ports, a substantial margin of capacity must be provided. It will be realized that ships do not always arrive on the date they are due, and may arrive sooner. Gaps occur during which few or no ships are working in the port; bad weather prevents working, and breakdowns of ship's tackle may occur. Such factors cause irregular demands on port facilities. To obtain efficient and fast working at a reasonable cost, the peak demand must be estimated and provided for.

It is therefore recommended that port development be undertaken to provide the following annual port working capacities:

	Tons
Khorram-shahr	500,000
Bandar Shahpur	400,000
Bushire	200,000
Bandar Abbass	100,000
Total	1,200,000

Exhibit H-6 shows the estimated traffic through the Persian Gulf seaports during the execution of the Seven Year Plan.

Efficient management and adequate clearance of the ports by road, rail and inland waterway will be essential to prevent congestion.

Accommodation for vessels lying alongside the jetties is adequate, except that an extension of 50 meters to the old jetty at Bandar Shahpur is recommended.

The recommendations include speedier and more careful cargo handling in the Persian Gulf ports by mechanization; the provision of more switching locomotives and railroad facilities; the leveling and concreting of port areas; and the provision of more transit sheds. At Bushire the approach channel needs dredging and tugs and barges are needed, together with an expansion of the Customs area and wharf and mechanization of cargo handling.

At Bandar Abbass, the existing jetty extension should be replaced by a longer and wider jetty. Some equipment is also needed.

The physical development should be accompanied by an administration development in the form of a Port and Inland Waterways Administration. This subject is dealt with elsewhere in this report. The total estimated cost of these recommendations for the development of seaports amounts to Rls. 363,930,000, of which Rls. 270,210,000 would be for foreign exchange. The expenditure would be in the years 1328, 1329, 1330, 1331, 1332 and 1334. It is emphasized that should the operation of any of the ports be delegated to privately owned companies, as previously recommended, the total expenditure would be reduced proportionately, and the balance used towards a Marine Department.

Future Port Development

Preliminary steps should be taken in regard to the location of future deepwater ports for Iran. Anticipations are that the traffic through Bushire may eventually be far in excess of that port's potential capacity, and that a deepwater port at Asalu may be needed to handle up to 1,000,000 tons per annum. Also that mining and other developments in South Iran may demand a deepwater port in a suitable location in the region of Ghishm Island.

If the project of attracting the ocean trade of Afghanistan through Iran is successful, a deepwater free port at Chahbahar may be contemplated.

At present there is no economic justification for any of these projects, and in any case it would be a number of years before serious consideration of them was needed.

Research and study are also necessary for a possible new site for the Caspian port of Bandar Shah, either at Farahabad or north of Bandar Shah. This again is not urgent.

A sum of Rls. 500,000 is recommended for preliminary reasearch and study. It includes foreign exchange to the amount of Rls. 300,000 for purchase of instruments and equipment.

Included in this report as appendices are detailed recommendations respecting the development of individual seaports. Appendix H-1 covers the Persian Gulf seaports, and Appendix H-2 covers the Caspian seaports. Exhibit H-7 gives the estimated expenditures by years and by seaports in the Seven Year Plan. These expenditures are summarized in Exhibit H-9.

IMPLEMENTATION OF RECOMMENDATIONS

General

In order to provide a base for the development of the ports under the Seven Year Plan, it is recommended that the General Ports Department of the Ministry of Roads and Communications should be expanded and reorganized into a Ports and Inland Waterways Administration remaining under the Minister of Roads and Communications. As a first and essential step a Director-General of Ports and Inland Waterways should be appointed. He should be a man of broad experience in modern port facilities and methods. In addition to the current administration of the ports in Iran he should have the duty of making the studies and arrangements for the Seven Year Plan developments. The Plan Organization would thus deal with one Director-General for all matters concerning ports and inland waterways.

The Director-General should gradually build up an efficient administration by expansion of the function and personnel of the General Ports Department. He would require the assistance of foreign experts.

The Ports and Inland Waterways Administration should be set up on similar lines to the Iranian State Railways, having control of the revenue derived from operating the ports. Costs of operating would be met from revenue.

The immediate measures recommended to meet the existing emergency at Khorram-shahr and Bandar Shahpur include the transfer of operating responsibilities from the Customs Administration to the Iranian State Railways, the latter organization to set up a separate port organization at each of the two ports. Thus, both ports should soon be running efficiently and would be ready for taking over when the Director-General of Ports is appointed.

Many modern port authorities delegate the operation of parts of their undertaking to privately-owned companies on suitable terms. If this could be done with any or all of the Persian Gulf ports, two real advantages would accrue: firstly, the cost of port development would be found from private capital; and, secondly, an element of competition between ports would be introduced. This would tend to speed up the working and make the ports more efficient.

The money thus saved from the Seven Year Plan funds could be used towards the equipment of an efficient Marine Department for the Persian Gulf and the Ports and Inland Waterways Administration.

It is considered that it would be prudent to follow this course. A proposed form of agreement is included in this report (Appendix H-3). This is intended for use as a basis of negotiation between the Iranian Government and interested private companies and is not exhaustive. The monetary consideration payable for such a concession by a company to the Iranian Government is a matter upon which insufficient data are available at this stage for any definite recommendations.

Overtaking Deferred Maintenance

The first step in deciding the priorities in overtaking deferred maintenance is to assess the problem. This could best be done by employing qualified engineers to make a complete survey and prepare a schedule of the necessary requirements. The urgent and special problem of the dredging and the maintenance of lights and buoys needs separate attention. A foreign expert in this field should be engaged for the purpose of the initial survey and retained to supervise the work in progress. He should be on the establishment of the Director-General of Ports and Inland Waterways.

Priorities for carrying out the work could then be decided and a program prepared by the Director-General of Ports and Inland Waterways to conform with the financial limitations.

Education and Training of Iranians

Suitable Iranians should be selected for training for all port and inland waterways duties, including port administration, management, dock and harbor construction, and engineering.

An assessment should be made of the future needs of the new Ports and Inland Waterways Administration so that foreign experts initially employed could be replaced in due course by Iranians.

Arrangements for overseas training should then be made. Some of the younger members of the staff of existing administrations who are now engaged in port duties should be included in this training scheme.

Port Development

The recommended program of work for port development cannot be implemented until a definitive project for each of the affected ports has been prepared. This should be done by consulting engineers specializing in this field. Contracts should then be placed for the work.

A careful decision should be made as to the type of mechanical equipment best suited to the handling of cargo in the ports before an order is placed. Tugboats and barges must also be of special and suitable type for their work.

Future Development Research

This project is not urgent. The initial work could be undertaken by the staff of the existing General Department of Ports. Suitable instruments and equipment will have to be purchased for this purpose.

AIRPORTS

The Department of Civil Aviation is at present engaged in the construction of a new terminal building and other installations at Mehr-abad. An appropriation has already been granted for this work and for strengthening the runways at Abadan. An appropriation has also been granted and we have been informed that orders were about to be placed for electrical, electronic and radio equipment which will provide instrument landing strips for Mehr-abad and Abadan, including field lighting and such other improvements as are needed to make these Class A international airports. Other portions of this equipment will be used to establish a modern system of airways control over the entire country.

We have examined the list of this equipment and have discussed the matter with the communications officer of the Department, as a result of which we have advised the Plan Organization that we approved these purchases.

The appropriations mentioned are outside the Seven Year Plan, and it is understood that whatever funds are allocated under the Plan will be in addition to the foregoing.

The tentative allocation of funds for airports under the Plan is Rls. 400,000,000, and within this approximate amount a program has been drawn up which meets with our approval.

This program calls for lengthening the instrument runway at Mehr-abad from 1,800 to 2,500 meters, widening it to 45 meters, and building a double hangar. Other improvements here and at Abadan are expected to be cared for out of the regular budget of the Department. The principal use of funds provided by the Plan is to improve the airports at the other principal cities of Iran where conditions are now essentially primitive.

Here, as with the road system, the question is largely one of priorities, but the solution is simpler, in that the needs at Tabriz, Shiraz and Meshed are particularly great and these are three of the most important cities. At all of them, the runways become unusable in rainy weather, so that if at any time the roads become impassable because of floods and washouts, it is certain that flying also will be discontinued. These three cities, then, are given first priority, followed next by Isfahan, because of its size and importance, then by Kermanshah, Babulsar, Ahwaz, Yezd and Bushire.

The locations of these airports are shown on the map, Exhibit H-2, and the recommended expenditures by locations and years of the plan are shown on the schedule Exhibit H-9.

IMPLEMENTATION OF THE PROGRAM

In our opinion, the equipment and other material required for the rehabilitation of the railroad should be purchased through the existing agency of the Iranian State Railways.

In view, however, of the large volume of these purchases, their importance in the national economy, and therefore their importance in the success of the Seven Year Plan, we recommend that no such purchase be permitted without consultation with and approval by the Plan Organization. We also point out, however, that the emergency requirements of the railway in the way of repair parts for existing equipment have already been extensively studied, and the purchase of these materials should not be delayed by much further review.

Our recommendation for the purchase of road-building machinery in amount of Rls. 65,000,000 is based on the assumption that contracts for the various road building projects would be awarded to Iranian contractors who at present own no such equipment. It is our opinion that this equipment should be purchased by the Plan Organization upon the recommendation of its Chief Engineer. It is our further opinion that the Chief Engineer should be advised in his choice of equipment by an engineer or contractor, or both, thoroughly familiar with and experienced in the use of the most modern types of road-building machinery. The equipment so purchased should be made available to contractors on a sale or lease basis on terms to be set forth in the contracts.

For a time, at least, it will be necessary to provide foreign operators and repairmen in order to train Iranian personnel.

With respect to completing the lines of railroad which we have recommended for completion, we are of opinion that this work should be delegated by the Plan Organization to the Ministry of Roads and Communications for handling by the engineering subdivision which has had these projects in hand up till the present time. The general control and supervision of the work, however, should rest in the hands of the Plan Organization, with all powers necessary to insure the efficient performance of the work and its completion at such time as conforms to the operation of the Seven Year Plan. Such powers should include the right to discharge the Ministry from further conduct of the work or any part of it if such a step, in the opinion of the Plan Organization, is necessary for the successful prosecution of the Plan.

The Ministry of Roads and Communications now has a considerable organization engaged in the construction and repair of roads. Although the principal function of this organization has been repair, the two functions go together in many of the new projects recommended above, and to set up a new department for road construction under the Plan Organization would result in considerable duplication of effort.

To handle the road projects contemplated in the Seven Year Plan would require considerable enlargement and strengthening of the subdivisions of the Ministry to which they would be assigned, and for this purpose we recommend that a study be made of the present subdivisions under the Ministry to determine the reorganization and strengthening necessary.

It is our opinion that the individual projects for road building should be delegated to this Ministry of Roads and Communications under such terms as the Plan Organization may deem appropriate, but that the Plan Organization should retain full authority over and responsibility for the road-building program under the Plan, and that its responsibility should cover the preparation of general specifications, approval of plans, general supervision of construction, and acceptance of the completed work. Its authority should include the power to discharge the Ministry from further work on any project, if such a step, in its opinion, became necessary to the successful prosecution of the Plan.

A general scheme for the administration of ports and inland waterways has been described in the section relating to the ports, and we recommend that this scheme be adopted.

We recommend that the program for improving the airports be delegated by the Plan Organization to the Department of Civil Aviation, which comes under the Ministry of Roads and Communications, and we further recommend that this Department should be enlarged and strengthened, if and as necessary, to perform the tasks imposed. Here, as elsewhere, however, the Plan Organization must retain full responsibility and authority for the proper planning, prosecution and completion of the work, including the power to discharge this Department as its agent if need be.

APPENDIX H-1

DEVELOPMENT OF THE PERSIAN GULF SEAPORTS

KHORRAM-SHAHR

Description

Once known as Mohammerah, the port of Khorram-shahr is an old one. It lies on the left bank of the Shatt-al-Arab where the Karun River joins it. Ships formerly always lay in the stream and cargo was carried to and from the port by small local craft. The Sentab jetty, a small T-headed jetty with a berth for one vessel, was constructed about 1317 (1938). This jetty was extended by American contractors in 1321 (1942) to its present length of one kilometer, giving accommodation for six to seven ships alongside. The railway from Ahwaz was brought to the port and to the Sentab jetty in the same year. During the war large tonnages of supplies to Russia were handled through Khorram-shahr.

The port is approached from the Persian Gulf through the Rooka Channel, 100 meters wide with a minimum depth of seven meters, up to the Shatt-al-Arab. The Karun Bar lies downstream from Khorram-shahr; the depths of the channel here vary from time to time, ranging during our investigation from five to six meters of water over the bar. Maintenance of the channel and lights of the Shatt-al-Arab is done by the Basra Port Directorate. The main road to Ahwaz is in bad condition and is subject to serious seasonal flooding. The port is served by a single-line standard-gauge railroad to Ahwaz. This railroad also is liable to bad seasonal flooding.

Vessels may berth alongside the jetty at all stages of the tide. Seasonal differences in river level are up to three meters. A southeast wind adds about two-thirds of a meter of depth and a southwest wind lowers the water level by the same amount. Oppressive heat in summer limits work.

There are five sets of buoys belonging to Iran upstream from the jetty, one of which is at present unsafe, as it has dragged. Deeply-laden vessels anchor and work off the Hartah Point, about six kilometers downstream from Khorram-shahr.

There is no Iranian marine organization or equipment at Khorram-shahr. The Berthing Master is an employee of the Customs Administration. It is not clear who has the responsibility for arranging the dredging and the care of buoys; both are badly neglected.

Apart from small local sailing and motor craft, mainly used to convey cargo for export to vessels lying in the stream, there are few harbor craft. Barges are obtained sometimes from Basra by shipping companies to assist the discharge of their vessels.

Khorram-shahr is a pleasant town with a promenade on both sides of the Karun River. It has good houses, offices and accommodation for foreign firms and their staffs. Roads are good and are being improved. The population is about 20,000. Surrounding the port area are date plantations.

The port facilities consist of one road- and rail-served wooden jetty, 1,000 meters in length, built parallel wtih the bank of the Shatt-al-Arab. The Customs area is also road- and rail-served and lies behind and downstream from the jetty. It has a small barge wharf. There are about 20 warehouses in the Customs area with a total capacity

of 26,000 tons and an open storage space with equal tonnage capacity. At Faleijeh Creek, about three kilometers up the Shatt-al-Arab from the port, there is a road- and rail-served wharf in fair condition, which is said to belong to the Customs. If dredged and equipped with cranes it could be used for landing and delivery of cargo from barges.

The Customs area has six mobile track cranes from 5- to 15-tons capacity, which are used in the port area and on the Customs wharf. There are six portal quay cranes lying some distance north of the port and three of the same type on the wharf at Faleijeh Creek. These nine cranes are privately-owned and do not appear to be in working order. At Faleijeh Creek wharf also is one 100-ton guy derrick belonging to the Anglo-Iranian Oil Company, which intends to remove it to Abadan shortly.

The port railroad is good, except that the Customs area is not well served. Behind the port lie several sets of sidings built for use of the American Army during the war. Some are now disconnected. Only one diesel switch engine and 97 flat and other cars are allocated for internal port working.

Operation

Stevedore labor on board ships is supplied by local contractors. Labor for working on the quay and in the Customs area is supplied by the Customs, and the Customs Officer directs the work on the jetties for receiving the cargo from ships and stowing it on railroad cars for removal to the Customs warehouses or yard. Shunting of the cars from the jetties to the Customs area is arranged by the Customs Port Officer but done by Iranian State Railways. Discharge of the cars in the Customs area and stowage in the warehouses or in the yard is done by the Customs, which also looks after the sorting as to marks and condition. After owners of the goods have cleared through Customs formalities, delivery is made by the Customs labor but the loading and stowage in the cars is done by ISR labor.

The recent bad floods and resultant cutting of all road and rail service to Khorram-shahr practically stopped the clearance of any cargo from the port for some time. Vessels continued to arrive and to discharge slowly at the jetty; the Customs area warehouses, roads to the jetty and the jetty itself became blocked with cargo. Ship discharge then practically ceased. Rail service has re-opened now but road clearance is still very poor. There is no lighterage service up the Karun River to relieve the situation.

Reliable figures are difficult to obtain, but it can be stated that the average rate of discharge of ships at the jetty has been about 2.5 days per ship until the last two months. Since then the rate of discharge has further deteriorated greatly.

Trade

Khorram-shahr handles almost all of the commercial cargo imported from overseas into Iran and this tonnage has recently increased. The main imports consist of iron and steel, paper, rubber tires for vehicles, automotive vehicles, cement, cotton goods, glassware, electrical machinery and drugs. Exports consist of dates, rice, grain, gum, cotton, tanning materials, fruit pulp and skins. Export cargo is not normally handled over the jetty, but is lightered by the owners of ships lying in the stream.

Labor

Local contractors are said to be able to supply 7,000 laborers in Khorram-shahr. The Director of Customs states that he employs about 550 permanently and 200 on a casual basis. Hours of work are 8 AM—12:00 Noon and 2:00 PM—6:00 PM. Overtime is worked, but no all-night working.

Recommendations

Emergency recommendations for steps which could be taken immediately to deal with the situation have been outlined previously in this report and need not be repeated here. Recommendations for port development to increase the working capacity are as follows:

Mechanical handling of cargo should be introduced and the following equipment purchased:

6—2-ton mobile cranes
10—2-ton fork-lift trucks
1000—steel pallets
3—diesel switching locomotives
4—Fordson-type tractors
16—2-ton trailers
4—2-ton diesel platform trucks

A properly equipped workshop will be needed for the repair and maintenance of this gear. At Faleijeh Creek one 5-ton crawler and three 3-ton crawler cranes are also needed. Additional transit sheds should be built of a modern type of light steel construction with lofty roof and high and wide doors so that mobile cranes can enter. Two of the transit sheds should be built to the north of the railroad line running from the jetty to the Customs area and a third in the triangle formed by the railway tracks to the west of this site. Additional ground should be secured and filled to the extent of 40,000 square meters; the new transit sheds should be rail- and road-served, which will involve the construction of 10,000 meters of new railroad track; new asphalted roads are needed in the port area for a length of 13,000 meters. Grading and concreting the surface of the port area for 100,000 square meters is also recommended so that the mechanical equipment can travel on the smooth hard surfaces and thus not be subjected to damage. It is estimated that the cost of these provisions will amount to Rls. 93,050,000 of which Rls. 69,510,000 will be for foreign exchange. The sum includes consulting engineers' fees for a definitive project. Schedules showing the estimated cost and the year-by-year expenditure on foreign exchange are as follows:

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Year	Purpose of Expenditure	In Thousands of Rials Domestic	Foreign Exchange	Total
1328	Consulting engineers' fee.....	640	960	1,600
1329	Grading and concreting surfaces	4,500	4,500	9,000
	Clearing and filling ground ..	3,200	—	3,200
	Locomotives and cargo-handling equipment etc.	—	10,000	10,000
	Construction of roads in port.	2,000	—	2,000
	Total 1329	9,700	14,500	24,200
1330	Grading and concreting surfaces	4,500	4,500	9,000
	Mechanical cargo-handling equipment and workshop..	—	4,550	4,550
	New transit sheds	5,000	35,000	40,000
	Laying railroad track in port.	2,000	10,000	12,000
	Construction of roads in port..	1,700	—	1,700
	Total 1330	13,200	54,050	67,250
	Grand Total	23,540	69,510	93,050

BANDAR SHAHPUR

Description

Bandar Shahpur is about 75 kilometers from the entrance to Khor Musa, a tidal inlet of the Persian Gulf. The approach channel is over Khor Musa bar, with eight meters depth at low tide and with a mean rise of three meters. Pilotage is compulsory from Khor Musa outer buoy to Bandar Shahpur. The bar channel is 1½ kilometers long. A standard-gauge single track railroad from Ahwaz connects the port with the Iranian State Railways' main line. There is no highway into the port.

The spring rise at the Khor Musa bar is four meters, and at Bandar Shahpur it is six meters. (All tides are irregular and unpredictable as to height or stream.) Flood tide lasts about 7½ hours and ebb 5½ hours, and the rate of flow is about 2 knots.

The "shamal" wind is from the northwest in summer, there are gales in the winter, fog sometimes in October and November. An average of about 30 working days is said to be lost by rain.

Four ships may anchor at the entrance of Khor Musa at a depth of 18 to 30 meters. Several more ships may anchor in Khor Musa. The buoys and lights are in need of spare parts and facilities for maintenance. A complete survey, overhaul, renewals, and replacement (in some cases by lighted beacons), are needed. Acetylene is in short supply.

Harbor equipment consists of:

1 Pilot boat (diesel) in poor condition. Little accommodation for pilot and crew. No radio.

1 Old tug (diesel) out of repair (230 hp.).

1 Launch in poor condition.

1 Rowboat with auxiliary engine.

2 Divers' suits are available but the rubber is said to be in poor condition and there is no pump.

Four 160-ton lighters without hatches are available but are generally in use by AIOC; towing is by AIOC tug to Bandar Mashur.

The rail terminal of Bandar Shahpur was built in a reclaimed area of mud flats, 1,700 by 400 meters, and filled to a height of 2 to 3 meters above natural level of mud bank. It is still incomplete and space for buildings and rail facilities is limited. The surrounding country is flat marsh liable to floods.

There are two jetties. The old wooden jetty was built in 1308 (1929) for landing railway construction material for the new Iranian State Railways, and was extended in 1315 (1936) to take two ships by a steel extension. The new jetty to take three ships was built in 1320 (1941).

The old jetty is 260 meters long and 13 meters wide. Depth alongside is nine meters at low tide. There are three railroad tracks on the jetty, with a single track lead-in. The hardwood decking is not flush with rails. Timber supporting piles, especially under the approach pier, are in bad condition. There is a mooring dolphin off the approach end. Owing to layout of tracks on the jetty, only one ship can discharge efficiently. The new jetty is 535 meters long and 21 meters wide, of steel screw-pile construction with steel bracings, sheathed with hardwood. Decking is of hardwood in uneven condition. There are three ship berths, with depth alongside of nine meters at low tide. The center berth has been dredged recently.

There is an unused lighterage berth behind the new jetty, an unused wharf up Bazaar Creek and an unused wharf two kilometers up Khor Zahed.

Lifting equipment consists of:

1 3½-ton mobile petrol track crane with small grab (ISR).

1 8-ton diesel rail-crane with 30-foot jib (Customs). This crane is not a suitable type for quick-working light cargo or bag cargo.

1 3-ton steam rail-crane (ISR) rarely in running order.

1 3-ton diesel rail-crane (ISR).

There are nine old warehouses owned by ISR and hired by Customs, with an estimated area of 3,300 square meters. The floor of one warehouse collapsed about three years ago with 600 tons of sugar on it. Six new warehouses are now in use, with an estimated 36,000 tons capacity for bag sugar. 15,000 tons can be stored in the yard area (including some small disused U. S. Army buildings).

There is one small workshop with meager facilities and no slipway.

The contractor stevedore has been supplied with all normal types of cargo-handling gear by F. C. Strick and Company.

There are three or four Davenport diesel switching locomotives allocated for yard and jetty shunting. Maximum number of loaded cars per shunt is 30. Railroad cars for internal port use are supplied by the ISR stationmaster. The marshalling yard has 11 sets of track for exchange sidings, and a similar yard for marshalling and sorting to and from jetties. There is a Y turning track for reversing locomotives, as there is no turntable.

There are few living accommodations at Bandar Shahpur beyond a few houses for the principal officers. There are no shops nor a bazaar, and supplies are brought in daily by the single passenger train. No outside road connection exists. Laborers and families live in abandoned U. S. Army buildings. There is a post office in the port and a direct telephone line to Tehran.

Water supply is said to be available from 0600 hours to 0800 hours and 1600 hours to 1800 hours by pipe line from Golgoa River. It is not chlorinated but it is filtered at the port. Ships often need water at Bandar Shahpur owing to lack of water at Kuwait and Bahrein, but the only usable water available in such cases is by rail-tank car (40-ton) from Ahwaz, which causes delay.

Power is supplied by three generators run by ISR.

Supply of labor is limited owing to lack of housing at Bandar Shahpur; most men do not bring their families. Estimated availability of labor is:

Stevedores	300
Customs	350
ISR	200
Total	850

Operation

The pilotage of vessels, navigation of the Khor Musa and berthing are the responsibilities of the Port Director of the ISR.

A firm of stevedores and contractors undertakes the unloading of cargo. No cargo can be placed on the jetty but must be placed by ships' gear and Customs' labor on flat or other railroad cars alongside the ship. The loaded cars are drawn by switch-engines (ISR) to the Customs area, where they are either unloaded by Customs labor into warehouses or open storage, or handed over to the ISR for outward haulage to destination. (This latter traffic is only certain AIOC and Government shipments.)

Customs tally clerks at the ship exchange signatures with ship's tally clerks for cargo landed, and Customs assumes responsibility until goods are retallied into warehouse. No claims arise by this method. The Port Officer (Customs) is responsible for handling of cargo from ship to point of terminal delivery, and the Railway Movement Officer (ISR) is responsible for movement of locomotives and cars in the port area.

When the consignee produces bill of lading and customs clearances, delivery to car is made by Customs labor, but ISR labor loads and stows the cargo in cars. Consignee must make arrangements with ISR to have rail cars at delivery point for the cargo. Customs is responsible for safe custody of cargo, examination, clearing or Passe-Avant documents to Ahwaz or Tehran. Army guards in the port area look after security and prevent pilferage.

The maintenance and repair of jetties are the responsibilities of the Construction Department of the ISR. The land on which the port stands is the property of ISR. Customs warehouses are leased from ISR or built by Customs on land leased from ISR by arrangement.

The Customs staff is composed of experienced men, well qualified to carry out their duties. The Director of Customs is directly responsible to Tehran. No export traffic passes through this port.

Delays occur to ships at the outer buoy owing to late arrival of pilots. Some buoys are out of action. Number 1 berth on the new jetty is allocated for unloading Iranian Army equipment and supplies. When a ship is working, both the other two berths on this jetty are kept vacant for security reasons. Customs has no authority over this traffic.

The majority of traffic (other than Army) consists of Government wheat and AIOC traffic for Bandar Mashur and Ahwaz by railroad. Only one ship can conveniently discharge at the old jetty. Some two to three working hours daily are said to be lost by shunting cars on the jetty if both berths are working.

Warehouses are full of cargo, including Government wheat in bags. The transit area is stacked with cargo such as steel rods, bars, crates of glass, packages of paper, old aircraft tires, bales, and crates of machinery. Few sheets are in use but dunnage is used where necessary. The Director of Customs says the congestion is not due to delay by Customs; his organization is more than adequate to meet requirements.

There is a shortage of box cars and consequently wheat will soon have to be stored in the open.

AIOC reports that ship discharge rates for its traffic are as follows:

Cement into box cars, 150 tons per hatch per day (12 hours)
Barytes into open cars, 200 tons per hatch per day (12 hours)
Heavy pipes into open cars, 70-90 tons per day per hatch
General cargo into box or open cars, 50-60 tons per day per hatch
Tonnage of cargo delivered overside to barges is about 40 per cent above the jetty rates of discharge

F. C. Strick gives the average rate of discharge of its vessels during February 1327 as 164 tons per ship per day.

The Customs organization consists of a Director and Assistant Director, a Controller with 20 staff and 40 daily employees. There is a Port Officer and staff responsible for traffic operation in the port. The Port Director's organization consists of a Director, staff and six pilots, and one berthing master.

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Recommendations

A project should be carried out as soon as possible along the following lines, the cost not to exceed Rls. 112,150,000:

1. The old jetty should be extended 50 meters so that two vessels may discharge simultaneously at the berths.
2. Additional working and storage space should be provided in the Customs area, and the surface of the areas graded and concreted so that mechanical cargo-handling appliances may be freely used.
3. A Customs area should be established at Sari Bandar, where the ground level is higher than at Bandar Shahpur. The new area should be leveled and fenced and used for rough and awkward cargo such as that now congesting the Customs area and railway yards at Bandar Shahpur.
4. Mechanical cargo-handling equipment should be provided as follows:

   For Sari Bandar

   3 2-ton and 1 5-ton mobile diesel cranes

   For Bandar Shahpur

   6 2-ton diesel mobile cranes
   10 Fork-lift trucks (2-ton) diesel
   2,000 Steel pallets
   4 Fordson-type tractors
   16 2-ton trailers
   4 Diesel platform trucks (2-ton)
   3 Diesel switching locomotives (Davenport type)

5. One workshop fully equipped to deal with the repair and maintenance of the above machines is necessary.
6. Three modern large transit sheds 150 meters by 30 meters should be built, with the necessary tracks on both sides of each.

   Fresh water to the port and to the berths on the jetties for ships should be supplied.
7. A future development of the port working capacity of Bandar Shahpur to 1,000,000 tons yearly is foreseen and the cost of a study to that end should be provided for.

The problem of the expansion of port facilities at Bandar Shahpur has been the subject of previous investigations, and three schemes have been examined at the General Ports Department of the Ministry of Roads and Communications. They are:

1. Plan de Bandar Shahpur prepared by the "Syndicate pour Chemins de Fer en Perse", Tehran, 15th October, 1929.
2. Bandah Shah-Pour Development of Harbour and Town, Tehran, June 1933; signed by Albert Kindt (a Dane).
3. Rapport concernant un projet du Port de Bender-Chapour par "la Societe Neer landaix de Travaux Maritimes, S.A. Amsterdam", November 1935.

All these schemes were prepared prior to the building of the new steel jetty in this port. They are ambitious and costly; none is suitable for present-day requirements but

the second scheme might be borne in mind when the project for development of the port to a working capacity of 1,000,000 tons per annum is under consideration.

A schedule showing the estimated cost follows:

Year	Purpose of Expenditure	In Thousands of Rials: Domestic	Foreign Exchange	Total
1328	Consulting engineer's fees	800	1,200	2,000
1329	Extending old jetty by 50 meters	2,500	5,000	7,500
	Water supply to port	500	1,500	2,000
	Grading and concreting surfaces	6,750	6,750	13,500
	Filling ground	3,200		3,200
	Locomotives and cargo-handling equipment		10,000	10,000
	Total 1329	12,950	23,250	36,200
1330	Grading and concreting surfaces	6,750	6,750	13,500
	Mechanical cargo-handling equipment and workshop		6,450	6,450
	Laying railroad track	2,000	10,000	12,000
	New transit sheds	5,000	35,000	40,000
	Total 1330	13,750	58,200	71,950
1334	Consulting engineer's fees		2,000	2,000
	Grand total	27,500	84,650	112,150

BUSHIRE

Description

The town of Bushire lies on a small peninsula formed by the Khor Sultani. The port is old and has played an important part in the history of Iran, but it has not developed to keep pace with the times. It is stated that the harbor, the approaches and the anchorages have been getting shallower by the formation of sand shoals. Bushire was once the principal port for goods from and to the districts of Isfahan, Shiraz and Kazerun, but ocean-going shipping is now limited to the monthly slow mail and a fast mail every six weeks. An occasional American ship calls and other vessels bring cement, machinery parts, water pipes, etc. when required. Last year 8,262 tons were imported and 4,570 tons exported through Bushire. The port is not served by a railroad and the highway to Shiraz is in poor condition. As a result of these and other factors most of the trade has been lost. In 1318 (1939) imports amounted to 92,867 tons and exports to 38,730 tons.

Ocean-going steamers lie at the outer anchorage some nine to ten kilometers distance from Bushire. Cargo is carried between the vessels and the port by small native sailing craft with a capacity of 15 to 40 tons each. Many of these craft are now fitted with auxiliary engines.

The depth of water in the outer anchorage is about eight to ten meters, and the least depth of water in the approach channel from the outer to the inner anchorage is about four meters. Smaller vessels can thus reach the inner anchorage which affords some shelter and is about five kilometers northwest of Bushire. The depth of water in the inner anchorage is about seven meters. The approach channel from the inner anchorage to the Customs wharf is between sand banks, shoals and mudbanks. Only shallow-draft craft can find their way through. Ships loading and discharging at the outer anchorage are delayed by bad weather during the winter months for an average of about three days per month. Cargo is landed in Bushire from the small craft at the Customs wharf (built on the left bank of the Khor), and placed in adjacent Customs warehouses. Movement thence is by road vehicles.

Summer weather is of intense heat when many of the inhabitants leave town. From an estimated population of 60,000 twenty years ago, the numbers have now decreased to 6,000 in the summer and 7,000 in winter. Water supply to the town is poor and potable water is carried to the town by commercial water carriers.

Local opinion is that an increase in shipping trade at Bushire would attract as many laborers as needed from surrounding villages and the necessary number of native craft from the Persian Gulf.

The waterfront of the Customs wharf is about 175 meters long, of which about 80 meters consist of a new wooden wharf three meters wide. The least depth of water alongside the wharf is said to be about one meter. Some 20 small craft can lie alongside the wharf except where the hulk of a sunken steel vessel lies just off the wharf.

The Customs area extends inland behind the waterfront to an average depth of 190 meters. This area is walled-in for security and contains the administrative offices of the Customs and some small brick warehouses and hangars. The total under-cover storage capacity is 20,000 tons. About 30,000 tons of cargo could be stored in the open spaces between the warehouses. Three of the largest warehouses are allocated for the storage of Government sugar. There is a system of industrial small-gauge railroad tracks leading from a fixed 7-ton hand crane on the wharf to the warehouses. Flatcars are available for use on this track (30 small and 5 large cars). There is one railroad power crane of 10-tons capacity in use. The surface of the Customs area is of hard earth.

Operation

The rate of ship discharge, under present conditions, is said to average 200 tons per day for general cargo and 400 tons per day for bag cargo, which would depend on the availability of empty space in the Customs area and warehouses. The limiting factor is the rate of unloading the native craft at the Customs wharf, and if the area were congested the discharge rate would be much decreased. It is estimated that if the Customs warehouses and areas were used as transit accommodation and not for storage, the port could handle with present facilities 200 tons per day for 300 days yearly, or 60,000 tons per year. There are privately-owned warehouses in the town, the capacity of which is not known.

In order to rehabilitate this port and to attract shipping by speeding the turn-around of vessels, thus affording a convenient port for the Province of Fars, the following recommendations are made:

Recommendations

The use of the warehouses in the Customs area as a depot for distribution of sugar and tea would cause a serious blockage in the port in the event of a revival of shipping trade. Cargo should not in such circumstances be allowed to remain in storage for more than three weeks.

A definite project should be executed along the following lines (the total cost not to exceed Rls. 126,300,000):

1. Improving and marking the channel from the inner anchorage to the Customs wharf.

2. Improving and enlarging the existing Customs wharf and area at Bushire as follows:

   a. Extension of the area by the inclusion and fencing of vacant ground adjacent to the existing customs area. Dimensions of the enlarged area to be 500 meters by 250 meters.

   b. Construction of a new wharf along the whole of the frontage of the extended Customs area to a length of 500 meters; the new waterfront to be taken out into the Khor Sultani to reach water of suitable depth. The hulk of the wreck lying off the wharf to be removed.

   c. Filling in the newly acquired land to above flood level.

   d. Construction of four new transit sheds on the extension. The new buildings to be of dimensions and construction suitable to the handling of cargo by mechanical means.

   e. Grading, levelling and concreting surface of the area up to a maximum expenditure of Rls. 22,500,000.

3. Providing mechanical handling gear for cargo as follows:

   10 fork-lift trucks—2-tons capacity
   2000 steel pallets—6′ x 4′—2-tons capacity
   6 2-ton mobile diesel cranes with 40′ jibs
   2 5-ton mobile diesel cranes
   4 Fordson-type tractors
   16 trailers

4. Providing means of lightering cargo to and from Customs wharf and vessels at outer anchorage as follows:

   2 Diesel tugboats
   12 Large lighters (shallow draft)

5. Providing a properly equipped workship on the waterfront adjacent to the Customs wharf for maintenance of craft and mechanical plant.

This work must be accompanied by provision for a first-class highway between Bushire and Shiraz.

Appendix H-1

A schedule showing the estimated cost of port development and foreign exchange needed follows:

Year	Purpose of Expenditure	In Thousands of Rials		
		Domestic	Foreign Exchange	Total
1328	Consulting Engineer's fees	800	1,200	2,000
1329	Dredging channel	—	5,000	5,000
	Sheet piling wharf 500 meters	2,000	10,000	12,000
	Building wall	1,000	—	1,000
	Mechanical cargo-handling equipment	—	5,000	5,000
	Total 1329	3,000	20,000	23,000
1330	Filling ground	7,000	—	7,000
	Grading and concreting	11,250	11,250	22,500
	Four new transit sheds	8,500	45,000	53,500
	Mechanical equipment and workshop	—	2,300	2,300
	Tugs and barges	—	16,000	16,000
	Total 1330	26,750	74,550	101,300
	Grand Total	31,250	95,050	126,300

LINGEH

Description

Lingeh was the ancient port of the Lars district. The town extends along the sea front and has an imposing appearance from the sea. It consists of large houses, business premises, Customs House, and other buildings. On landing it is seen that the town is to a large extent in ruins, but the bazaar is still in use in part for the remaining inhabitants. There are said to be 2,000 people living in Lingeh. The town is built on a coastal strip, flanked and backed by high arid mountains.

We were informed that the old road to Shiraz was out of use and beyond repair. Such produce and goods as come by land to Lingeh are carried by camel or donkey over a track through the mountains. A new coastal road to Bandar Abbass is said to be under construction. The main purpose of this road is to allow better control over smuggling. There were no signs of motor cars or lorries in the town.

The anchorage for deep sea vessels is two kilometers offshore where there is a depth of about ten meters. Cambers and native craft carry the cargo from ship to shore.

There are two small tidal basins built of stone and cement which are each about 70 meters square. The remains of a stone jetty are seen extending from the corner of the eastern basin. The basins dry out at low water and have a depth of from 1½ to 2 meters maximum at high water. It is said that these basins have silted up, but they are in fair condition otherwise and are used by dhows which lie on the sand and are so discharged and loaded. There is a small Customs warehouse and local merchants say they have, adjacent to the port, empty warehouses with a capacity of 10,000 tons.

Water supply is from birkehs which are visible around the town. These collect surface rain water which brings much silt with it and is a precarious source of supply. Those we saw were dry, with bottoms covered with cracked mud. They were badly neglected and it is evident there is some other source of supply from wells, but we could not find out where.

The climate is hot and humid in summer, warm in winter, and there is little rainfall. The region is unhealthy and malarial.

Trade

Several dhows were seen lying offshore and two were in the basins discharging shells, dried fish and earthenware water jars. Fishing and pearl-fishing, trading and smuggling seem to be the main occupations apart from agriculture. Evidence exists of some cultivation of date palms, tomatoes, vegetables and cereals. A plane calls from time to time for air mail. It was said that this once thriving small port has been killed because of the following reasons:

Diversion of traffic through Khorram-shahr
No road connection with interior
Government control and taxation
Corruption
Centralization of business in Tehran
Exchange difficulties

What legitimate trade remains is the barter of goods between Lingeh and points on the Oman coast and Kuwait. It is carried on by the masters of dhows.

Recommendations

The rehabilitation of Bushire and Bandar Abbass will accommodate shipping for the next few years. No expenditure is therefore recommended from the funds of the Seven Year Plan for the port of Lingeh.

Dredging of the basins might well be undertaken by local labor.

BANDAR ABBASS

Description

Bandar Abbass is one of the oldest ports in Iran. It serves particularly the southeastern part of the country and once had a considerable volume of business. The location of the port is due to the comparatively easy access through the mountains from the interior and to the shelter afforded to shipping lying off the port. The masonry jetty was built by the Portuguese many years ago and the extension to this jetty, now used by dhows, was built by the Indian Army during World War I. The sea approach is from deep water in the Strait of Hormuz to the anchorage in Clarence Strait. The road to Kerman through the mountains is fair-weather only and needs repair. There is no rail connection. The tidal stream at the anchorage is about two knots. The anchorage is sheltered from "shamal" (northerly) winds in summer and the winter "kos" winds from the southeast are light. Heavy swells are experienced in the anchorage and on the beaches. The tem-

perature varies from 45° F. in winter to 110° F. in summer and the climate is unhealthy in summer. Tidal variation is up to three meters' depth of water. A number of ships can lie at the anchorage about five kilometers offshore, where there is a depth of water of about eight meters. Buoys and lights are said to be maintained by the Persian Navy.

The town is on a coastal plain of sand dunes, rising to foothills and mountains. Many buildings are old and dilapidated, but there is evidence of new building and road reconstruction. There is a straight, wide, tree-lined highway east and west through the town and four lateral streets leading to the waterfront. The population is said now to be reduced to about 14,000 in winter and 10,000 in summer. A military garrison is located here. Trade and industry consist of shipping (local and overseas), fishing, agriculture, a small sardine cannery and a cotton thread mill. The Anglo-Iranian Oil Company has a package oil distribution center at the east end of the town; the containers are received by lighters from Abadan and are dispatched inland by road. Water supply to the town is by birkehs, but potable water is brought in from the Naiband River. Telegraph service is available to the rest of Iran and there is a local telephone circuit. The local power station has a 90-kw diesel-driven generator. There is a natural airfield at Forudgah Motafeghm, about 25 kilometers from Bandar Abbass. A sea wall and promenade, which is not in good condition, runs along the waterfront for some 600 meters. Beaches are of sand and the water is shallow inshore.

Landing and loading facilities consist of an old masonry jetty some 74 meters long by 34 meters wide, on which stands a small shed with open front. Access to deeper water is along an extension of the masonry jetty about 170 meters by 4 meters. This extension is built of old rails driven into the bed of the sea and braced. The decking is of hardwood and two narrow-gauge railroad tracks run the length to a T-head at the end of the jetty extension. Depth of water at the T-head is said to be about 1¾ meters at low water and 4 meters at high water. The installation is in usable condition, although no maintenance seems to have been done for years. It is narrow and inconvenient for its purpose. The railroad tracks run directly into the Customs area and to the warehouses therein. The warehouses are of brick construction, in good condition, and have a capacity of some 10,000 tons of sugar.

Two portable tripods with lifting blocks are used in the Customs area. There are some trolleys and cars of various types for use on the small railroad. Their condition varies, and some are usable.

Operation

Cargo is discharged from or loaded into steamers lying at the anchorage offshore. Heavy swells interrupt the work. Cargo is carried between ship and jetty by dhows, many of which have auxiliary motors. Capacity of dhows is from 5 tons to 30 tons each. It is stated that increased trade would attract sufficient dhows to deal with it. A fortnight's notice is needed so that ships' agents can order the dhows in time. All cargo is handled by hand at the jetty. Packages of over one ton are not, therefore, usually consigned to Bandar Abbass. Labor on the jetty and in the Customs area is supplied by the Customs for all purposes. All cargo passes through the Customs area, where it is cleared through the formalities. Complaint is made by shipping agents and merchants of pilferage of cargo between ship and Customs warehouses. The entire direction and operation of the port (except marine) is in charge of the Customs Administration. The Customs warehouses are now used as a storage depot for receipt and distribution of

Government sugar and tea. If this practice continues during a revival of the shipping trade, the port will quickly become blocked.

The Director of Customs at the port stated that, with existing facilities and methods, ship discharge would average about 200 tons daily. A maximum day's ship discharge of 500 tons of sugar in bags is remembered locally.

Trade

The shipping trade of eastern Iran, formerly enjoyed by Bandar Abbass, has been largely lost owing to the rise of the rail-served port of Khorram-shahr, the bad condition of the road to Kerman, and the centralization of trade in Tehran. At present the British-India slow-mail steamer calls twice monthly, but little cargo passes. An F. C. Strick & Co.'s ship may call twice yearly if sufficient cargo offers. Strick's vessels call four times yearly at Hormuz Island for red oxide in bulk from the mine there. About 8,000 tons to 10,000 tons are shipped yearly, but this traffic does not greatly affect the port of Bandar Abbass as it is shipped from the island by dhows to the vessel. Salt in bulk was formerly shipped in the same manner from mines on the island of Ghishm. This trade, too, appears to have died, although efforts are being made to revive it.

Last year 30 ocean-going vessels called at the port. Considerable traffic passed through also by dhows trading with other ports in the Persian Gulf. Smuggling is said to be rife. The bulk of the legitimate imports consisted of sugar and tea for Government account.

Labor is said to be ample and villagers would be attracted to the port should the shipping trade revive. Hours of work are not fixed and overtime can be resorted to as the jetty is lighted.

With present facilities and methods we estimate that the port could handle 60,000 tons per annum, and that with improved facilities, as recommended below, it could handle efficiently 100,000 tons per annum.

Recommendations

Cargo should not be allowed to remain in storage for more than three weeks because the use of the warehouses in the Customs area as a depot for distribution of sugar and tea would cause a serious blockage in the port in the event of a revival of shipping trade.

A project should be carried out along the following lines as soon as possible (the total cost not to exceed Rls. 27,430,000):

1. Demolition of existing extension of jetty, built of old steel rails driven into sea bed, with hardwood decking and narrow-gauge railroad.
2. Lengthening of existing masonry jetty, by a masonry or other suitable extension, 200 meters by 10 meters, including laying double track of narrow-gauge railroad along the length. Extension to have a T-head, 15 meters long by 6 meters wide.
3. One 5-ton fixed power crane to be placed on the T-head to plumb 5 meters from edge, and one 5-ton diesel mobile crane to be provided in the Customs area.

Improved maintenance of the road to Kerman and Lars is essential if the port is improved as recommended.

Appendix H-1

A schedule showing the estimated cost follows:

Year	Purpose of Expenditure	In Thousands of Rials		
		Domestic	Foreign Exchange	Total
1328	Consulting Engineer's fees	200	300	500
1329	Demolition of jetty extension	130		130
	Building new extension	7,600	18,000	25,600
	Total 1329	7,730	18,000	25,730
1330	Purchase of cranes, etc.		1,200	1,200
	Grand Total	7,930	19,500	27,430

CHAHBAHAR BAY

Chahbahar Bay is situated on the Gulf of Oman almost due south of Zahidan. A road or track connects the two places. From our inspection and from maps and other sources of information, we believe that Chahbahar Bay is worth study as the possible location of a future deepwater port. It is therefore recommended that studies be made at some time within the limits of the Seven Year Plan, and funds have been provided for this purpose.

ASALU (NABAND BAY)

Naband Bay is a large circular inlet in the coast with an entrance of 5/6 kilometers wide. It is very exposed to the "shamal" winds from the northwest but is sheltered from "kos" winds. There are high mountains to the north with a sandy coastal strip about 1½ kilometers wide rising to the foothills. There is some date and grain cultivation on the coastal strip and the village of Asalu is on the northern shore, with some 600-800 inhabitants. Access to the interior is by a track through the mountains. Water comes from wells and birkehs. A Customs post is stationed at Asalu. Some small dhows were drawn up on the beach and one was lying offshore.

There is deepwater in the center of the bay and coral rocks on the bottom where the water shallows off to the shores of the bay. The entrance is five to nine fathoms deep in the center with rocky extensions from shore which would be useful for construction of harbor moles to give protection from the northwest winds. Local stone is available for construction of moles and walls.

The location is considered worth further investigation if the project of a road-served deepwater port in the vicinity is undertaken. The matter is not urgent.

POSSIBLE SEAPORTS BETWEEN GHISHM AND JEZIRAT HENJAM ISLANDS

We were informed that the anchorage off Ras al Mashia was sheltered in all weather. At Ghishm Island, a depth of 6 fathoms could be found fairly close offshore.

On the island of Jezirat Henjam there are the remains of a British naval base said to have been built during the 1914-1918 war and used until 1942 by the Persian Navy as

a refueling and watering station. Some twelve large buildings remain in fair condition. There is also an iron or steel jetty about 3 meters wide and 50 meters long in usable condition. The decking is of hardwood. Police and Customs posts are manned. Water is from birkehs which were full with about 3 meters' depth of water when inspected. The lighthouse on Jezirat Henjam Island is abandoned. Fresh water is said to be available nearby in Ghishm Island.

This location is worthy of further study as a possible site for a deepwater rail-served port. The proposed railway would have to be carried over from the mainland to Ghishm Island. The project is not urgent.

APPENDIX H-2

DEVELOPMENT OF CASPIAN SEAPORTS

PAHLEVI

Description

About 40 years ago a Russian organization had a concession for the construction of a road from Tehran to Pahlevi (then called Enzeli) and a harbor was built at Pahlevi. During the reign of Reza Shah Pahlevi the harbor was modernized. At the outbreak of World War II the port was taken over by the U. S. S. R., which returned it to Iranian use in 1948.

The approach from the Caspian Sea is without navigational difficulty during good weather. The harbor affords good shelter for shipping, but entrance and exit of shipping is restricted by bad weather some 40 days yearly on an average. The tidal variation is negligible. The weather is wet and cold in winter and hot in summer.

There is a good highway to Resht, which is the provincial capital and is on the main highway to Tehran.

The city has a population of 30,000 and has fine administration and private buildings. Public gardens with a promenade on the water front of the harbor are a feature. There is a Royal Palace with large grounds. Two well-built concrete road bridges with lift spans cross the two channels leading from the harbor back into a large sea lagoon (Murdab). The installations of the Mahie fisheries are on the shore of the lagoon. Fishing is an important industry. Rice growing and cleaning is the main occupation outside the town. Pahlevi is the Iranian naval base for the Caspian Sea.

Pahlevi harbor consists of two masonry sea moles protecting the harbor area. Water front is given to the Royal Palace grounds, the town, and to areas belonging to the Soviet Consulate, the Mahie fisheries and to the Port Administration, workshops and slipway. Cargo vessels load and unload at the Customs wharf adjoining the Customs area and warehouses. There is an oil jetty at the Soviet oil compound at which tankers with bulk oil from Baku can be discharged into tanks ashore.

The Customs wharf can accommodate four of the usual type of Soviet vessels alongside. It is of steel sheet piling with a hard earth and cinder surface. There is a 10-ton diesel track crane belonging to the Customs. Depth of water alongside the wharf is 3½ meters. There are seven good brick warehouses (6,600 square meters area) and one hangar (834 square meters). Open storage is available.

Equipment includes a suction dredge Mazandaran, built in 1315 (1936) with a capacity of 1,000 cubic meters per hour; a small bucket dredge, and auxiliary dredging equipment such as barges, pipes and a tug for each dredge. The suction dredge is undergoing repairs and its tug is still in Russian possession. There is also a small fireboat in the port.

The Port Administration has well-equipped workshops for repair work and a large slipway, in good condition, built to take the suction dredge. The slipway platform is raised and lowered by electric power. Harbor construction plant includes a steam-driven pile driver and two small ones, a concrete mixer and two mobile compressors and generators.

Operation

The General Ports Department of the Ministry of Roads and Communications controls the port and harbor, and the Marine Department of its Pahlevi Port Administration controls navigation pilotage, floating plant and equipment of the harbor.

The Customs administration owns the Customs area and undertakes all operations on cargo, including discharging and loading ships alongside, warehousing and delivery of goods. No charges are made to vessels using the port either by the Port Administration or the Customs.

Trade

The small amount of cargo imported through Pahlevi at present consists of stores and material for the Mahie fisheries, which is all duty free. Fish and fish products are exported. There is no ordinary commercial trade now. The Customs warehouses are empty except for some Iranian-grown tobacco in bales.

Recommendations

The port is idle except for the Mahie fisheries. No expenditure is recommended except for deferred maintenance. The suction dredge is badly needed at Pahlevi and at the other Iranian ports on the Caspian Sea, and the repairs should be expedited so that dredging can recommence at an early date. It is estimated that the amount of dredging to be done in Pahlevi harbor is 160,000 cubic meters.

BANDAR SHAH

Description

The old jetty at Bandar Shah was built about 1305 (1926) as a rail terminal for the purpose of importing railway construction material and rolling stock from Europe via the Caspian Sea during the building of the Iranian State Railways. During the last war the port was taken over by the USSR for shipping supplies to Russia, which were carried to the port by rail from Bandar Shahpur and Khorram-shahr. The center and new jetties were built by the Russians during the war. The Iranian Government resumed control of the port in 1325 (1946).

The approach channel from deepwater in the Caspian Sea is 21 kilometers in length and is marked by buoys. Width of channel is 50 meters and depth should be maintained at 5 meters. There are 31 buoys, including 17 light buoys along the channel and a lightship at the entrance of the channel. The approach channel is badly silted up and the buoys and lights are neglected and in bad repair.

The port consists of three wooden jetties with railroad tracks and a bulk oil installation for discharge of oil from Russian ships to the oil tanks ashore. Details are:

Old jetty: Rail approach on embankment 538 meters by 6.5 meters wide. Single line of track. Ship berths, length 101 meters by 18.3 meters, 3 tracks. Four ships can be alongside at one time. The jetty is in very bad condition.

Center jetty: Rail approach 149 meters. Ship berths, length 103 meters by 13 meters wide, 2 tracks. Two ships can be alongside.

New jetty: Rail approach 170 meters. Ship berths, length 164 meters by 20.5 meters wide, 4 tracks. Depth alongside 3 meters. Four ships can be alongside. This jetty is now under repair by the ISR.

Oil berths: Two oil berths lie east of and connected to the old jetty.

Customs warehouses are in a compound over two kilometers from the ship berths and have a rail connection. There are seven warehouses of floor area 6,600 square meters. Open and hangar storage is also available. Labor in the Customs area is supplied by the ISR. The warehouses are in good condition but are nearly empty.

There are two diesel 75-hp tugs in the port, together with a lightship built in 1282, (1903), which should be at the channel entrance. The lightship is in very bad condition and the tugs are not in good repair.

A floating crane, built in 1316 (1937), has a capacity of 40 tons and appears to be in good condition, except for the hull which needs examination.

Operation

No shipping now uses Bandar Shah, but in the event of a resumption of trade with the USSR, important tonnages might have to be handled. The whole of the work and maintenance of the port is the responsibility of the Port Director of the ISR. Sea approaches should be looked after by the General Port Department of the Ministry of Roads and Communications.

Recommendations

The Director-General of the ISR intends to dismantle the center and old jetties and to dispose of the materials, which is the best course to pursue. He also intends to dismantle the floating crane and tugs and transfer them to Bandar Shahpur for repair. The crane would be a great asset at that port. It is recommended that the new jetty be kept in condition until the decision as to an alternative location for the northern port is taken.

BANDAR GAZ

This port is now obsolete owing to recession of the Caspian Sea from Gurgan Bay on the shores of which Bandar Gaz once stood. The Customs warehouses are in use for the storage of tobacco. No recommendations are made respecting this port.

NAUSHAR

The harbor works of Naushar were commenced in 1314 (1935) by the Netherlands Harbor Works Company on the order of Reza Shah Pahlevi. The port was completed except for dredging, warehouses, outside walls and concreting of quays and roads when, at the beginning of the war, it was taken over by the USSR. It was used for shipment of military supplies to Russia by large barges. It is said that 5,000 tons daily were shipped at the busiest period. The port was taken over again by the Iranian Government in 1325 (1946).

The port and harbor consist of two moles of masonry. The quays for cargo lie at the landward end of either mole. Part of the harbor is silted up and the process is continuing. The Caspian Sea has receded in recent years but it is said that last year a slight increase in depth was recorded. Storms occasionally prevent the movement of ships; during 1326 (1947) there were 80 such days. The harbor is used now only by local fishing vessels seeking shelter. No cargo is handled in the port.

There are well-equipped small workshops containing power-driven lathes, drills, cutters, hammers and saws. A meter-gauge railways runs from the port workshops to a local quarry nine kilometers away where the masonry for the harbor was obtained. Small steam and diesel locomotives with hopper and platform cars are used, but this equipment is not in good repair. Some construction equipment left behind by the contractor is used for harbor repair work. There are five electric quay cranes (rail-mounted) with capacities from 7 tons to 25 tons. Power for the port is furnished by a diesel plant having a capacity of 270 kw.

Although Naushar is idle, it is a well-designed harbor and port. It is the nearest port to Tehran and may yet be called upon to handle important tonnage. It is recommended that maintenance of the harbor be continued.

BABULSAR

Port facilities at Babulsar consist only of a small wharf on the riverside. The wharf is partly dry and only small local craft use it. There are two brick Customs warehouses behind the wharf with a storage capacity of about 2,000 tons. The warehouses are empty and there is now no shipping trade. Previous to the war, shipments of oranges, cotton and rice were made to the USSR. No recommendations are made for the port of Babulsar.

FARAHABAD AND KHADJENEFES

These places were inspected as possible sites for a new rail-served port on the Caspian Sea in place of Bandar Shah where serious difficulties were being met by reason of the silting up of the approach channel and berths.

At Farahabad a creek about 30 meters wide and about 2½ meters deep flows into the sea. The location is a flat coastal area of sand dunes. A fisheries station is built there but there is only a rough road or track to the coast from the Shahi-Bandar Shah road. An old Russian chart in the possession of the ISR at Bandar Shah shows that deep-water can be reached from the coast at Farahabad in a much shorter distance than it can from Bandar Shah or from the Khadjenefes district.

Khadjenefes is at the mouth of the Gurgan River in the plain north of Bandar Shah. Local residents informed us that the channel west of Khadjenefes used by vessels bound for Bandar Shah was badly silted.

Farahabad seems to be the better choice for an alternative port to Bandar Shah. Studies should be undertaken so that a considered decision can be made.

APPENDIX H-3

PROPOSED ARRANGEMENT FOR PORT OPERATION

Grant a concession to a private company of the right to operate Khorram-shahr as a seaport on the following terms:

1. The ownership of the land on which the port stands and of the fixed port installations at present in existence to remain vested in the Iranian Government.
2. The existing movable port installations and mechanical and other appliances to be taken over by the company at valuation by an independent and recognized valuer.
3. The company to be formed and carried on in conformity with the Iranian law.
4. The concession to be for a period of seven years with option to the Iranian Government of renewing the concession at the end of that period at its pleasure.
5. The Iranian Government, should it decide not to renew the concession at the end of seven years, to have the right to purchase from the company such port installations and equipment as it may decide at either—
   (a) valuation by independent assessors, or
   (b) cost price less depreciation,

   as the Iranian Government may determine.
6. The capital of the company to be subscribed for and ordinary shares held by—

   The Iranian Government as to 30 per cent
   The promoter of the Company as to 30 per cent
   The general public as to 40 per cent.

   These proportions not to be altered by the subsequent purchase and sale of shares.
7. In the event of the company going into liquidation the assets of the company in movable port installations and equipment of the port of Khorram-shahr to be taken over by the Iranian Government at valuation or cost less depreciation as it may determine.
8. The financial structure of the company to be agreed by the Iranian Government before formation of the company.
9. The company to undertake at its own expense the necessary new construction or improvement to installations and the provision of mechanical and other plant and gear so as to make the port capable of dealing speedily and efficiently with cargo to a minimum of 500,000 metric tons gross deadweight per annum.
10. The Iranian Government to perform the dredging of the Shatt-el-Arab alongside the ship berths of the port so as to maintain a minimum depth of 25 feet. Also to maintain the berthing and other buoys in good order and condition.
11. The company to provide, maintain and operate adequate facilities for lighterage of cargo to and from vessels lying at the jetty or in the stream from and to the wharves and jetties of the port.

12. The company to perform directly or through contractors all handling and manipulation of cargo necessary to the efficient operation of the port.

13. The company to perform directly or through contractors all haulage of cargo by railroad or road in the port-transit and warehousing areas, and to provide the necessary rolling stock and switching locomotives or other means of transit for this purpose. Terminal services on cargo for delivery to railroad to be performed by the company on behalf of the railroad on terms to be agreed between the parties.

14. The company to give a satisfactory bond to the Director-General of Customs as a guarantee for the Customs duties and taxes due to the Customs on cargo placed in the warehouses of the company in the port area and taken to account by the Customs upon reception in those warehouses.

15. The company to erect and maintain at its own expense a secure wall or fence around the land boundaries of the port area. Fence or wall and road and rail gates to be of a pattern approved by the Director-General of Customs.

16. The company to have the power to levy charges on owners of

(a) Ships for berthing and wharf facilities and stevedoring and other services, and
(b) Cargo for wharfage, handling, storage, rent and services performed.

Such charges not to exceed a scale to be agreed to by the Iranian Government.

17. If at any time, due to the negligence or other fault of the company or its servants or agents, the operation and maintenance of the port is not carried out to the satisfaction of the Iranian Government, the concession may be cancelled by the Iranian Government. The port and all the installations and equipment thereof may be taken over by the Iranian Government and the company would be compensated in accordance with the procedure given in paragraph 7 above.

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COMMUNICATIONS

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COMMUNICATIONS

INTRODUCTION

The need for comprehensive communications facilities and services in Iran is urgent, even at the present level of industrial-commercial development of the country. The progressive expansion in development to be expected under the Seven Year Plan must be paralleled by the establishment of extended and improved telecommunications and postal services if the needs of the country are to be served adequately.

These services should be sufficiently extensive and of such quality as to:

1. Meet the requirements of increasing industrial and commercial development.
2. Knit together more closely the people of the country into the political, social and economic life of the nation.
3. Provide a ready and effective means for the dissemination of information and educational programs, particularly in the field of radio broadcasting.
4. Provide a rapid and reliable means of communication during periods of catastrophe, national emergency and for the security of the country.

This section of the report is devoted to the common carrier telecommunications and broadcasting systems of the country which are used for the public service. These systems are operated by the Ministry of Posts, Telegraphs and Telephones (PT&T) and the Iranian Telephone Company (Telephone Company), which operates under the terms of a concession from the Government.

The communications services associated with the Iranian State Railways and the Civil Aviation Administration are used solely in the operation of these entities and are included in the transportation section of this volume.

PRESENT TELECOMMUNICATION FACILITIES AND SERVICES

GENERAL

For convenience, this subject is treated under the four general categories: telephone, telegraph, radio and broadcasting. We include only the facts essential to establish a basis for the conclusions reached and to support the recommendations set forth later in this report.

TELEPHONE

Local Facilities and Service

The telephone communication system in Iran is operated as a concession by the Societé Anonyme des Telephones Iraniens, a private corporation (Iranian Telephone Company, hereinafter referred to as the Telephone Company). The original concession was granted to the General Telephone Company in 1903. It permitted the construction of the telephone plant and facilities anywhere in Iran and required that telephone service be extended wherever necessary. About 35 years ago this company sold the telephone concession for Resht and the surrounding area to the Societé de Telephone de Resht. There are several sub-concessions operating in certain other areas of the country.

At the present time the local development has attained about the level shown in the 21 principal cities listed below on the basis of available population and telephone statistics. The remaining communities have been grouped together. There are about 24,000 telephones in service in the entire country. The following table shows the distribution by cities:

City	Population	Approximate Number of Telephones in Service
Tehran — City	800,000	10,000*
Meshed	200,000	720
Tabriz	205,000	660
Isfahan	200,000	1,340
Shiraz	120,000	870
Resht	140,000	1,080
Hamadan	105,000	440
Kermanshah	100,000	600
Ardebil	60,000	60
Rezaiyeh	50,000	110
Yezd	55,000	490
Kerman	50,000	290
Ahwaz	50,000	440
Kazvin	55,000	270
Arak	61,000	480
Abadan	65,000	150
Khorram-shahr		230
Maragheh	30,000	100
Burujird	47,000	210
Kashan	45,000	340
Ghum	50,000	500
Total — Principal Cities		19,380
Other		4,200
Total		23,580

* The number of telephones for the city of Tehran is estimated.

This development represents a density of .133 telephones per 100 units of population.

For the purposes of comparison the following table shows the density of development in other countries in 1948.

Country	Telephones per 100 population	Population
Argentina	4.0	16,275,000
Brazil	1.0	46,850,000
Chile	2.1	5,214,000
Colombia	.5	11,460,000
Peru	.5	8,600,000
Czechoslovakia	2.9	12,096,000
France	5.2	40,541,000
Germany	3.3	53,121,000
Greece	.8	7,862,000
Italy	2.1	45,657,000
Spain	1.8	28,332,000
Turkey	.2	21,057,000
Egypt	.4	24,953,000
Morocco	.5	9,031,000

The Telecommunication Section of the Seven Year Plan does not recommend nor provide for the expansion of local telephone service. There must be parallel development of the local and long distance services if the needs of business and Government are to be adequately served and the maximum revenues derived for the operation and expansion of the services. It is requisite, therefore, that provision be made for the expansion of local telephone service in the various cities of the country.

It is considered technically and economically feasible to attain an overall development in local telephone service of 110,000 stations at the end of the Seven Year Plan period, and this is the minimum level of service which will suffice to meet the needs of general business and governmental activity. This development would indicate a density of approximately .6 telephones per one hundred units of population, which is comparable to that of other countries of about the same economic status.

The city of Tehran is, of course, the controlling and major point in the local service problem of the country and must be given continuing attention in the Seven Year Plan period. The existing local system in Tehran is built around a 6,000-line automatic unit of Siemens & Halske manufacture. It was impossible to extend this unit during the war years and, as a result, this equipment is congested as regards its traffic-carrying capacity and additional service in number of subscribers is precluded.

To relieve this situation the Telephone Company has contracted with the General Electric Company of Great Britain for the installation of 22,000 lines of automatic equipment and the associated outside plant. The installation should be ready for the initiation of service by the new plant during the year 1329 (1950). It should be noted in this connection that there are some 15,000 paid applications on file with the Telephone Company for service upon completion of this new plant.

There seems little doubt that this additional plant will not suffice for the Seven Year Plan period and consideration should be given to further extension in Tehran during that time.

In all other cities magneto-type central office equipment is employed. This equipment is generally obsolete in type and in an advanced stage of deterioration. This type of equipment is not suitable for the service needs of the principal cities. All of the equipment observed is poorly installed and the maintenance is totally inadequate to obtain the normal service that this type of equipment is capable of providing. While the installation and maintenance standards vary widely over the country we found no facility that could be considered to be capable of furnishing acceptable local service.

The local staffs generally appear excessive and with the limited revenues available under present service conditions wages are low. Higher wages are essential to the building of morale and service efficiency for the improvement of quality of service.

The local telephone exchanges are generally poorly located from the standpoint of public convenience. The structures are not suitable for the business, and the space layout is both inefficient and unattractive to the public.

It appears to be the general practice to collect substantial deposits from potential subscribers, who may be required to wait several years for actual service connection and it is understood receive no credit nor refund of the deposit. Also subscribers are required to purchase their own telephone instruments. Such practices are considered to be en-

gineeringly and economically unsound, and conflict with the maintenance of suitable service standards, sound company financing and rate structures.

Internal Long Distance Telephone Facilities and Services

Until 1326 (1947) the only long distance telephone service in Iran was that furnished by the Telephone Company with the exception of a few private company-owned lines existing in the northern and southern parts of the country. These latter facilities were established with the permission of the Government and are managed and operated by these companies for their sole use.

About the beginning of 1326 telephone service was established for public use over the copper wire telephone circuits and speech carrier systems built by American and British Occupation Forces and which were purchased by the Iranian Government in late 1325. These facilities are maintained and operated by the Ministry of Posts, Telegraphs and Telephones. These circuits link Tehran with Ahwaz via Ghum, Arak, Malayer, Khorram-Abad, Andimishk and with Baghdad via Kazvin, Hamadan, Kermanshah and Ghasre-Shirin at the Iran-Iraq frontier. Existing internal long distance telegraph and telephone lines are shown in Exhibit J-1.

The operation of these facilities by the PT&T is in competition with the Telephone Company in the telephone field. This competition is restrictive to development, inasmuch as neither agency can enjoy the full benefits of long distance revenues so necessary to the expansion and improvement of the service.

The facilities purchased by the Government from the occupation forces are poorly operated and the terminal equipment and lines are deteriorating rapidly due to inadequate maintenance. Service is not reliable and the quality of transmission is unacceptable most of the time.

The Telephone Company's long distance lines are all of single iron wires of two to four millimeter diameter supported on wood poles. Even for this type of facility the lines are poorly constructed due in part to the lack of suitable native pole timber but mostly because of cost considerations. Transmission standards are non-existent, and service over the Telephone Company's facilities is not reliable and is limited under normal conditions to a distance of 100 to 200 kilometers.

No connection with the local telephone service is provided by either the Telephone Company or the PT&T. It is necessary in either case for the public to go to the respective offices of these agencies and talk from a booth. In general these telephone booths are inconveniently located, equipped with obsolete and poorly-maintained apparatus and in some cases are in a deplorable state of repair and sanitation.

It is desired to emphasize the need for the parallel development and interconnection of the local and long distance telephone services. This follows from the fact that much of the plant is used in common for both services, and revenues to be derived from the two services are mutually self-supporting. Stimulation of either service reacts favorably on the other. Maximum public service can be attained only by the complete interconnection and integration of the local and long distance telephone facilities, and the only proper practice is to provide a system which permits any telephone subscriber to talk to any other from his office or home.

The present condition is due in part to the condition of the local plant and the use by the Telephone Company of single grounded iron wire long distance circuits which cannot meet any acceptable standard of transmission quality. A contributing factor in the case of both agencies appears to be the denial of the subscriber that the call was made from his telephone, and the possible inability to collect the charge for service. A method must be found by sound regulation and education of the subscribers to eliminate the present practice, which will prove restrictive to the development of an efficient service.

For the above reasons and also because of the possibility of consolidation of the paralleling pole line structures, it is considered advisable to treat all of these services on a combined rather than a separate basis.

The major pole and wire routes of the PT&T are constructed with imported steel poles which have many remaining years of service life. These pole lines carry large-gauge single grounded iron wire circuits.

In addition the PT&T, as previously mentioned, has acquired copper wire telephone circuits and speech carrier systems from the American and British Occupation Forces. In general, these facilities are carried on separate pole lines directly paralleling the previously constructed telegraph lines of the PT&T.

The Iranian State Railways maintains pole and wire lines along its right-of-way. These pole lines carry a major portion of the copper wire facilities of the PT&T and are generally paralleled by the pole lines of both the PT&T and the Telephone Company.

It is technically feasible today with modern telephone and telegraph carrier systems to effect an almost complete consolidation of pole line structures. The equipment required is moderately priced, efficient in operation and provides high quality transmission. In many cases, the total paralleling facilities can readily be consolidated on the existing copper wire circuits and at the same time permit future expansion without increasing the number of these basic copper wire circuits.

It is desirable to point out and emphasize the enormous economies to be achieved by such consolidation. The more important are summarized briefly as follows:

1. Greatly reduced plant investment.
2. Greatly reduced annual charges and operating costs on plant investment.
3. The simplified problem of maintaining one rather than several pole line structures. This will enable a reduction in plant failures and duration of such failures.
4. The greater reliability of service.
5. The increased speed of service and therefore the increased traffic capacity of facilities.
6. The re-use of salvaged removed plant in the construction of new pole lines and wire for projects to be carried out under the Seven Year Plan and particularly to communities not presently served by any form of telecommunication services.
7. Finally, the possibility of increased revenues because of low capital expenditure.

International Telephone Facilities and Service

With the exception of the facilities of the PT&T which provide telephone service to Baghdad, Iraq and short haul circuits connecting points adjacent to the frontiers, all other international telephone service is by radio.

The transmitting and receiving facilities for radio telephone communication are situated at Tehran. These installed transmitting facilities consist of the following:

One 20-kilowatt Standard Telephones and Cables Company double side band transmitter, placed in service during Dey 1327 (January 1949). This is used for telephone service to Berne and London, for telegraph service to remote points, and for short wave broadcasting.

One 2-kilowatt Standard Telephones and Cables Company double side band transmitter placed in service in Dey 1327. This unit is also used for both telephone and telegraph.

One 14-kilowatt voice, 30-kilowatt telegraph Telefunken double side band transmitter equipped for both telephone and telegraph, but inoperative due to lack of tubes.

One 7.5-kilowatt RCA double side band transmitter equipped for both telephone and telegraph, but inoperative due to lack of tubes.

Two 2-kilowatt Wilcox transmitters used for telegraph operation, secured from U. S. Army Surplus.

One 2-kilowatt medium wave (standard band) broadcast transmitter, operating on 890 kilocycles.

One 600-watt Telefunken transmitter used in telegraph operation with Anglo-Iranian Oil Company station at Abadan.

Three rhombic antennas and several other directional and non-directional types.

The installed receiving facilities are located some distance from the transmitters on the opposite side of Tehran. The only operating receiving facilities are two RCA diversity receivers, one of obsolete type and the other recently acquired. Several rhombic and non-directional receiving antennas are employed.

The transmitter building is of modern design and air-conditioned, with space for additional equipment. It is well maintained and in good condition.

The equipment is properly installed and the maintenance is good. There is no excuse for the Telefunken and RCA transmitters to be inoperative because of lack of tubes which are available in quantity today, but responsibility for this situation appears to result from failure of appropriation of funds.

Telephone service direct with Berne and London appears to be reliable and of good quality. In Farvardin (April) of this year service was inaugurated with Norway via London and with Italy via Berne. Tests have been made with American Telephone and Telegraph Company, New York, relayed through Berne and the results were considered satisfactory, but service has not been established to New York at this time.

The international telephone service is not interconnected with the local or long distance internal telephone facilities. Cabins are provided in the PT&T building in Tehran and all users of this service must go there to file application for a call and talk

from these cabins. The waiting rooms and cabins are in inaccessible locations in the basement of the building and are poorly maintained.

TELEGRAPH

Internal Facilities and Service

The telegraph communications system in Iran is under the direct control of the Government, with immediate responsibility vested in the Ministry of Posts, Telegraphs and Telephones.

With negligible exceptions the service is provided by means of hand key and sounder equipment over single iron wire lines of from three to six millimeters diameter. There are a few Wheatstone and other more or less antiquated items of equipment in use in Tehran and several other cities. The lines are carried on about 84,000 cast iron, 2,500 steel and 1,000 cement poles on the main trunk routes and about 180,000 wooden poles on the subsidiary and some trunk routes. The telegraph network covers about 18,000 kilometers, containing about 31,000 kilometers of wire. This system handles about 80,000,000 words annually.

The cast iron, steel and cement poles are generally in good condition and satisfactory for many years of useful life. This is true even of the cast iron poles installed across Iran from Julfa to Zahidan about 90 years ago, as part of the London-Bombay telegraph line.

The wooden poles are, in general, superior to those of the Telephone Company and are better installed and maintained. The quality is substandard, due also to lack of suitable native pole timber.

That the keys, sounders, relays and associated equipment almost universally employed in the telegraph service are in good condition, is due more to their solid and durable construction and simplicity of operation than to adequate maintenance. Installations are generally poor. Except in a few of the larger offices, where lead-acid storage batteries are used, century-old type copper sulphate batteries are employed. With some notable exceptions the batteries are poorly installed and the maintenance is very poor.

In Tehran the telegraph office is located in the PT&T building. All circuits terminate in a single room where about 40 telegraph operators work in a congested space under most unsatisfactory and difficult conditions. The conditions are similar in the case of the radio telegraph circuits which terminate in a nearby room.

The facilities provided to the public for filing telegrams are poorly arranged and inadequate. The PT&T building is in a bad state of repair and is unsightly and dirty.

Except in Tehran, the Post Office and Telegraph Office occupy the same building. In the majority of cases the offices are poorly situated from the standpoint of public convenience and are poorly maintained.

There is no testing equipment for either the terminal apparatus or the wire lines, except that in connection with the latter there are a considerable number of points along the telegraph lines where telephone instruments are installed, to assist in line maintenance. In general, line breaks and circuit failures are found only by the time-consuming and costly procedure of sending a repair crew to patrol the line until the damaged portion is

located. In many cases the lines are now located far from roads and traverse terrain that presents formidable obstacles to the repair crews.

Regenerative repeaters are seldom used, and messages from remote points often must be repeated manually. This procedure results in much delay and many errors in transmission.

The service is slow, even between points having direct wire connection, and it is a common occurrence to have mail delivery or a journey completed over great distances before a telegram which started at the same time reaches its destination. This unsatisfactory situation results as much from operating inefficiencies and poor organization as from the technical limitations of the telegraph system.

In some cases pole lines run parallel to each other, notably Tehran-Ghum and Tehran-Kazvin, with neither pole line carrying its full capacity of wires. The lines are too close to each other to provide satisfactory alternate routes to minimize trouble.

From discussion with representatives of the Ministry of Posts, Telegraphs and Telephones and others it appears that delivery of telegrams is inefficient and slow, due in part to lack of personnel and suitable transportation.

International Facilities and Service

Telegraphic communications with foreign countries are carried over the wire lines, described in the foregoing, exclusively to Iraq and Afghanistan, to India by wire lines to Bushire and thence by submarine cable, to the Soviet Union by both wire line and radio and to New York, London, Paris, Beirut, Ankara, Pakistan, Kabul and Berne by radio.

Telegraphic communications to foreign countries over the wire line facilities are transmitted, within Iran, by the methods and over the plant facilities previously described and are subject to the same inefficiency due to poor plant conditions as the domestic service.

The radio telegraph service is provided by the radio transmitting and receiving facilities at Tehran which are listed previously. With the exception of the defects already noted this equipment is in good condition and provides satisfactory performance over the radio links in the foreign telegraph service.

BROADCASTING

Broadcasting service in Iran is provided by facilities of the PT&T, the Army and the Gendarmerie.

In Tehran the PT&T broadcasts on both short and medium waves and the Army provides some programs over these facilities. In addition the Gendarmerie provides some broadcast service from its own short-wave station of medium power.

In Tabriz the PT&T has broadcast facilities and provides a short-wave broadcast service.

The Army provides a very limited broadcast service from its own low power stations in Meshed, Isfahan, Shiraz, Sanandaj, Khorram-abad, Ahwaz, Kermanshah and Kerman.

Post, Telegraph and Telephone Facilities

The 20-kilowatt Standard Telephones and Cables Company short-wave communication transmitter in Tehran is used for international broadcasts about one hour daily in the early evening. The remainder of the time the short-wave broadcasting employs the 2-kilowatt Standard Telephones and Cables short-wave communication transmitter to complete the schedule for domestic broadcasts.

At present the circumstances and equipment do not permit the best choice of frequencies at all hours and seasons for domestic broadcasting. Two kilowatts is not considered sufficient power to fulfill the needs of the domestic short-wave service. In addition a 2-kilowatt medium wave transmitter is employed for the standard band schedule in Tehran. This equipment is in good condition and capable of good quality broadcast transmission.

The standard band broadcast antenna is not efficient and its radiation pattern is undoubtedly affected by the proximity of the nearby radio towers and communication antennas; also, the site is not good for medium-wave broadcasting due to poor ground conductivity.

The Tehran studio facilities are located in the transmitter building. There is at present only one small studio, totally inadequate for any but the simplest type of programs and with only rudimentary acoustic treatment. One control desk and disc reproducer provide the only other studio and programming equipment. The facilities are in reasonably good condition but are incapable of producing programs of the scope and technical standard considered acceptable today.

The transmitting facilities at Tabriz consist of a 7½-kilowatt RCA short-wave transmitter. At present the power output is less than two kilowatts because there is not a full complement of rectifier tubes. This condition has existed for a long time despite the fact that these tubes are inexpensive and procurable from stock. This transmitter was installed by the Russians during their recent occupation of the Tabriz area. The installation is good, but because of inadequate maintenance the equipment has deteriorated and is in need of reconditioning.

In Tabriz two studios provide fairly ample facilities, but they are substandard in acoustic treatment. The control equipment is an improvisation of commercial and home-made units which function fairly well but are believed to be substandard in performance.

MARINE RADIO

There are at present no marine radio facilities at any of the ports for communication with shipping. This fact contributes to the inefficient operation of the port facilities.

FUNDAMENTAL FACTORS CONTROLLING DEVELOPMENT

The fundamental factors which control the development of adequate communications facilities and services must be properly evaluated and applied to maximum effect in an initial program, in this case seven years. This is essential as the work done in this period will be the foundation for the continuing and permanent development of the plant and services. These factors are:

1. The recognition of communications as a service to the public whether operated by Government or private agencies. Service ideals must be established and the inculcation of these ideals made an essential part of the training of all personnel engaged in the rendering of communication services.

2. Sound organization, which is essential to the successful development of the services. This point is of great importance in view of the existing divided yet competitive activities of the Government and private agencies now engaged in the operation of communications services.

3. The limitation of investment and operating costs through the sound design of the physical plant.

4. The maximum use of the material and industrial resources of the country, thus conserving foreign exchange required for the importation of materials and equipment.

5. The maximum and efficient use of labor.

6. The training of Iranian personnel in the technical design and the operation and maintenance of the plant to meet adequate standards of service.

7. The rendering of a good quality of service to the public at reasonable rates and with an adequate return on the investment. To this end it is essential that the agencies engaged in the operation of the communications services be controlled and regulated as regards the rates charged to the public and the financial returns to the owner.

8. The establishment of recognized public utility accounting procedures and an independent audit are necessary to the protection of investment, the interests of the securities owners and the efficient conduct of operations.

9. The concurrent development, in proper relation, of the long distance and local telephone services. These services are mutually dependent upon each other in their effectiveness as viewed by the user and mutually supporting as regards the revenues required to support the investment in plant and the operating costs.

10. The effective co-ordination of all the communication facilities so that each type may support the others should service be interrupted.

SYSTEM DESIGN CONSIDERATIONS

GENERAL

In order to establish a technically and economically sound telecommunications system under the Seven Year Plan it is necessary to give consideration to certain outstanding factors affecting the general plant construction program. These factors have been considered in preparing the recommendations presented hereafter.

LOCAL TELEPHONE PLANT

While the precise determination of the type of local service plants best suited technically and economically to the needs of the country must be dependent upon more detailed studies, the following table indicates the probable choice for cities or areas of varying density of development in number of station (telephones).

Number of Stations	Type of Service
0 — 500	Magneto
500 — 2,000	Manual Common Battery or Automatic
2,000 — upward	Automatic

The type of service indicated is of course subject to modification by many factors. For example, in the case of the areas having a density of development of 500 to 2,000 stations the choice should give close consideration to the volume of long distance traffic to be handled. This point is important, as an automatic central office may require a large associated long distance and special service switchboard, and in such cases it may be more economical to handle both the local and long distance service on a manual basis.

The type of outside plant to be constructed should reflect consideration of housing conditions, municipal regulations, climate and whether individual or party line service is to be offered.

Buildings

There should be standardization of the type of buildings used for the service. Buildings should be located to meet the conditions of the fundamental plan. Main street locations may be costly because of land values and a less costly convenient site may be available. This site selected, however, should be accessible to the public when commercial offices for the payment of bills and other public contact services are involved.

It may not prove economical to own the building required for the small magneto offices, and where suitable quarters can be rented for reasonable periods such procedure may be preferable.

LONG DISTANCE TELEPHONE AND TELEGRAPH

The long distance telephone and telegraph services of the country are treated jointly because of the possibilities and advantages in the consolidation of the physical plants of the two services and the ease with which facilities for either service can be derived from a consolidated plant.

In the development of the long distance services, consideration should be given to the following factors:

The distribution of population

The topography of the country

The maximum use of existing plant

The use of modern equipment and operating techniques

The resources available in the country itself

The need for early communications between cities and areas not presently connected

The ability of the personnel to respond to the training required for the operation and maintenance of the modern facilities to be provided.

As a general basis for the development of the long distance services of the country during the Seven Year Plan period and conforming to the general conditions previously laid down, there appear to be certain logical phases of development, some of which can be carried out concurrently.

The telegraph network of the PT&T consists of large-gauge single iron wire grounded circuits supported on imported steel poles, at least on the major routes.

It would be feasible in those cases where at least two such wires are available on the same pole line to create a metallic speech (telephone) circuit which would afford proper transmission quality between principal cities or towns located in succession along any given route, such as for terminal traffic between Tehran and Ghum, Ghum and Kashan, and Kashan and Isfahan. In addition, it may be possible to interconnect such intermediate or terminal circuits for traffic over longer distances by the use of cord circuit repeaters at the intermediate points; for example, Tehran—Ghum and Ghum—Kashan circuits could be used for traffic between Tehran and Kashan and perhaps for longer distances.

As a typical example, it would be well to consider the Tehran—Ghum section. There is a PT&T line along the railroad right-of-way. This line carries copper wires and superimposed carrier systems which were acquired from the Allied Occupation Forces. There are also two separate parallel steel pole lines of the PT&T along the more direct highway route from Tehran to Ghum. One of these lines carries four large gauge iron telegraph wires and other three such wires.

If we consider the first of these latter two lines, two metallic telephone circuits could be established by proper transposing of the wires, a question largely of local labor.

In order to provide the same number of telegraph circuits as now in use on both lines or a greater number if desired, multi-channel carrier telegraph systems could be superimposed on these two metallic circuits. By this means, the pole line carrying three wires could be vacated and salvaged for re-use in the construction of new lines projected under the Seven Year Plan. In addition to the several advantages previously cited, there is the major economy resulting from the material available for re-use which would reduce the purchase of high-cost imported material for new construction and effect a reduction in capital and maintenance charges on the present duplicate plant.

This treatment is not proposed with the idea of using such circuits as the permanent long distance network of the country, but it has the advantage that local labor is the major factor necessary to provide commercial telephone circuits at an early date where they do not now exist.

It is suggested that a section of line such as Tehran to Ghum should be selected as an experimental section for the determination of the method to be used and the extent to which the above treatment can be practically applied. In this section the line should be properly transposed and all wire joints soldered. Loop resistance and insulation

resistance measurements should be made. Impedance runs at voice frequencies and carrier frequencies might also be made. While operation of speech carrier systems over those circuits is not necessarily contemplated, these tests will determine if such operation, particularly of single channel systems, is feasible.

FUTURE LONG DISTANCE PLANT

General

The conditions existing in Iran are complex as regards the design and development of the permanent "backbone" communications plant and service. This is particularly true when considering the degree to which short-wave radio and modern multichannel very high frequency (VHF) and ultra-high frequency (UHF) radio relay facilities versus land line wire and superimposed speech and voice frequency carrier telegraph facilities could and should be used. A map of the proposed facilities is appended as Exhibit J-2.

On first consideration it may appear desirable and feasible to establish quickly a network of short-wave radio stations to provide the permanent extension of telephone and telegraph facilities. When, however, sound evaluation is given to the technical and economic factors, reliability and quality of service and the operational problems involved we believe that short-wave radio should be limited to the following applications:

1. The earliest possible installation of short-wave radio stations for both telephone and telegraph service in Tehran and about 12 other principal cities to provide direct interconnection in the shortest practicable time. While we do not believe that the service provided by these facilities will be acceptable for regular permanent future use, the time factor, together with the emergency service they will provide in case of failure of the proposed permanent plant, justifies their installation.
2. The use of a limited number of low power short-wave radio stations to provide initial communication between remote and isolated areas and the basic communication system.

Among the more important defects of short-wave radio communication which severely limit its effective use for a permanent national communications system are:

1. The long distance propagation characteristics of the short-wave band. This results in mutual interference with other services on a generally world wide basis and requires the use of so-called secrecy devices which, unless costly and complicated, may deter but do not prevent interception of messages.
2. The transmission vagaries of ionosphere supported transmission restrict the reliability and quality of service and on occasion disrupt the service completely for appreciable periods of time.
3. The quality and reliability of service is degraded by noise, which results from natural static (lightning) and man-made interference from electrical devices. As the industrial development of the country progresses this latter source of disturbance will attain increasing importance.

Because of the rapid development of VHF and UHF radio relay systems, providing multi-channel operation of telephone and telegraph services, the use of these methods for

the extension of communication services in Iran under the Plan has been given detailed and searching study in comparison with wire line techniques. As the technical factors involved in this new field are not generally well known, it is considered desirable to present at this point some of the outstanding and determining conditions to support the conclusions and recommendations that follow. Radio relay systems have been developed and are in use in both the VHF (30 to 300 megacycles) and the UHF (300 to 3,000 megacycles). Essentially these radio relay systems make use of that portion of the radio spectrum in which the characteristics of propagation limit reliable communication to relatively short distances. Long distances are spanned by the use of intermediate receiving and transmitting facilities that pick up and retransmit the radio signals. These intermediate facilities are commonly called relay stations. The use of the VHF or UHF portion of the radio spectrum permits wide band transmission, thereby providing multi-channel operation of telephone and telegraph services. Single or double frequency modulation, pulse time or combinations of these two systems of modulation are commonly employed.

The VHF and UHF radio frequencies have quasi-optical propagation characteristics. Until recently it has been customary to calculate the signal intensity versus distance by assuming a smooth spherical earth with uniform ground constant and a standard atmosphere in which the dialectric constant of the air varies uniformly as the height above the earth increases. The average bending of the radio waves due to refraction in the standard atmosphere is included by assuming that the effective radius of the earth is increased to four-thirds of its actual value. It has long been known that atmospheric refraction can and does cause very large and persistent fluctuations in signal strengths and operating ranges in the frequencies under discussion. The meteorological origins of these effects are complex and varied and occur in some form all over the earth's surface. Variations in signal intensities result from reflection and refraction from air mass boundaries and other meteorological irregularities. The dependence of radio propagation on the weather increases as the frequency increases and the variation in signal intensity increases as the distance from the transmitter increases. Beyond the horizon the major factor affecting signal intensities is the effect of the troposphere.

It is evident that the maximum distance that can be spanned, in any given link of a radio relay system that will give reliable service at all times, is determined by the minimum value of fading signals.

In addition to the propagation characteristics described above, there is the effect of terrain. Because of the quasi-optical characteristics of the radio frequencies in question, terrain irregularities have a marked effect on the signal intensity under any given conditions. Irregularities between transmitter and receiver such as mountains or hills produce transmission losses. When optical line of sight path is not realized the loss may be very great. This so-called shadow loss increases as the frequency increases.

It can be seen that the distance that can be spanned in any link of a radio relay system is dependent upon the height of the transmitting and receiving antennas. Theoretical considerations predict and practical experience confirms the fact that antenna height is the most important factor in the distance that can be covered by a radio relay link operating in this frequency range.

The topography of Iran presents formidable obstacles to the development of radio relay systems to link the principal cities because of the high and rugged mountain ranges almost universally encountered. In some parts of the world the mountain summits or at least high slopes are accessible and can be used to advantage as sites for the relays. The

nature of the mountains of Iran and the climatic conditions encountered make the development of elevated sites too costly to be justified. Along many routes the only feasible alternative is to use a large number of short links.

While it appears that the effect of climatic conditions in Iran is not unfavorable to VHF or UHF propagation in general, it would be unsound, in our opinion, to include radio relays in the system of national communication without first studying propagation characteristics of the various sections of the country for at least a year. Conditions should be selected that would include both flat and mountainous terrain between stations.

The use of the radio relay systems is not open to the objections cited for the use of short waves. If frequencies above 50 megacycles are employed there is virtually no ionosphere transmission and the problems of interference and interception outside of the border of the country are for all practical purposes non-existent. The techniques employed in multiplexing channels and the modulation systems generally employed make casual domestic interception difficult and therefore unlikely. The addition of relatively inexpensive secrecy devices would for all practical purposes suffice.

Experience has demonstrated that economic justification of radio relays to provide a national network of backbone communication facilities is dependent to a great degree on the traffic density. The estimated telephone and telegraph service requirements in Iran in the foreseeable future are far below those required to make the use of radio relays economically sound.

While the use of radio relays would appear to offer a solution to the pilfering of copper wire lines, it is felt that the relay stations would be subject to pilferage or damage unless guarded, with the net result that the problem would not be resolved and the cost of adequate protection to the stations would exceed the cost of wire line protection.

While it is admittedly possible that later developments will employ radio relays in the telecommunications systems in Iran it is our considered opinion that the backbone communication plant to be constructed under the Plan should be wire line facilities plus telephone and telegraph carrier.

This type of plant will make the best use of existing facilities and will provide a technically and economically sound basic communication system.

The design of the permanent plant can properly be considered in the separate phases of:

1. The backbone or major routes.
2. The subsidiary points readily connected to 1.
3. The widely scattered or rural areas.

Backbone Network

In considering the economic factors controlling the design of the backbone plant, it should be appreciated that there are existing steel pole lines located along the railroad carrying the railroad's communication and signalling facilities. These pole lines must be retained in any event. In addition, the PT&T and the Telephone Company both maintain pole lines which generally are located along the highways.

It is considered that very generally where railroads exist or are projected under the Seven Year Plan period or where there are existing steel pole lines of the PT&T

these lines should be used to carry basic copper wire facilities (generally a single two-wire copper circuit) on which can be superimposed the carrier facilities as described previously.

In designing the principal route or backbone network, consideration should by all means be given to the early consolidation of the facilities of all three communications administrations. This should be directed to the complete elimination of existing duplicate parallel steel and wood pole structures.

It is understood that there are available from the Iranian State Railways a large quantity of salvaged steel rails which are unsuitable for use in track. These rails are entirely suitable, however, for the construction of pole lines. With this stock of rails and existing steel poles, which can be made available by the consolidation of duplicate parallel pole lines, there would appear to be sufficient steel poles in the country to meet the requirements of all proposed main pole line extensions which should be considered under the Seven Year Plan.

The existing pole lines of both PT&T and the Telephone Company frequently diverge from the highway routes and traverse terrain which is remote and difficult of access by patroling linemen for maintenance and protection against wire pilferage. These short cuts were made at the time of the original construction in order to reduce cost and in some cases because highways were virtually non-existent. The use of these pole lines as the major copper wire routes compels attention to this condition, as high quality maintenance is essential to securing the maximum results of these modern facilities. Where new pole line construction is to be undertaken they should follow the railroad or highway routes as closely as practicable. Likewise, consideration should be given to re-routing the existing pole lines where the conditions of terrain are most difficult and particularly at the time of major construction or rehabilitation projects.

Subsidiary Centers

There are many cities and towns which are not located along the backbone traffic routes but which have close community interest with the principal cities located along these routes. This concept applies to both telephone and telegraph traffic.

The method of connecting these subsidiary points to the general network is dependent upon detailed engineering and cost studies as regards the choice between radio and wire facilities. For the purpose of this study consideration can only be given to the interconnection of a reasonable number of such points and to the factors which will generally influence the choice of the type of plant. These factors are as follows:

1. The cost of plant.
2. The local telephone plants for the small community should be of the magneto type. Such plants are adequate for both local and long distance needs of small communities and do not require power supply facilities except for the transmitter current which can be supplied by local batteries.
3. There should be available for re-use a great quantity of wood poles and iron wire which will be salvaged as the result of the consolidation of duplicate lines. This material can be used for the construction of the short branch lines from principal centers to small communities and provide an entirely acceptable type of plant for the purpose and at low cost. Metallic circuits will permit the application of telegraph facilities where they are justified. In this connection, there are many cases where the volume of

telegraph traffic originating in small communities located along a principal pole and wire route will be so small that the cost of providing telegraph equipment and operators cannot be justified. For such traffic there is good reason to establish "Telefonogram" service. The few messages per day could be telephoned from the principal center to the telephone exchange in the small community. Where the addressee is a subscriber to the telephone service the telegraph message can be delivered directly and otherwise it can be dispatched by messenger from the telephone exchange.

Rural Areas

The development of adequate communications services into the rural areas of the country is subject to the same conditions that prevail for subsidiary centers as described in the previous section. The vastness of the area and the great number of rural communities make it evident that only the most important rural centers can be connected to the general network during the Seven Year Plan period. Everything possible should be done to speed up this development and this is particularly important with respect to the need for the dissemination of information, educational instruction, news, market quotations and all information which will advance and improve the conditions of the people resident in these areas.

We believe that radio links operating in the VHF band can be established at low cost to provide communication into many of the rural areas from the basic network. This method may well prove more reliable for this service than wire facilities due to the lack of good transportation with the consequent difficulty and high cost of installing and maintaining wire lines.

Where rural community centers are located along or close to principal wire line routes, branch circuits should be provided with long distance pay stations for the use of the rural community.

TELEGRAPH SERVICES

Delivery and Receiving Service

The customer should be permitted and encouraged to telephone his telegrams to the telegraph office from his home or office telephone, and incoming telegrams should be delivered in the same fashion. It should be possible to effect an agreement between the Ministry of Posts, Telegraphs and Telephones and the Telephone Company for the handling of this service and to establish regulations which should reduce uncollectible bills to a negligible amount.

There is general complaint as regards the long period of delivery of telegrams and the Post and Telegraph Department is aware of the difficulties involved. The comments made previously, both as regards outside plant operation and maintenance and the staff efficiency, should be studied as it is believed a great improvement could be made in a reasonable period of time and at moderate cost. In Tehran consideration should be given to the establishment of branch offices with teleprinter circuits to the main telegraph operating office. Telegrams could be filed at such offices and quickly dispatched by teleprinter to the central office. Likewise, incoming telegrams could be dispatched by teleprinter to the branch office nearest the addressee and delivered by messengers stationed at the branch office.

Telegraph Equipment

The present telegraph equipment is outmoded in every respect. This problem should be studied urgently for the selection of the types of equipment best adapted to the plan and today's service needs. There should be general adoption of tape perforation methods of transmission with automatic tape relay or switching at intermediate points. Also, every consideration should be given to the use of teleprinter equipment which does not require a trained telegraph operator of any greater degree of competence than that of a good typist. This method of transmission will greatly increase speed, reduce errors and provide a reliable record of messages sent and received.

This modern office equipment should be associated with the modern voice frequency carrier telegraph systems, which are high in speed of transmission, moderate in cost and can readily be placed in operation over present copper and iron circuits.

There should be periodical inspections of buildings, office equipment and staffs and of the outside plant. Such inspections should be made from general headquarters and more frequently from regional headquarters, and should be implemented by reports to the main administration of conditions encountered and recommendations for improvements and changes in practice.

BROADCASTING

It is generally recognized that long, medium and very short waves are best suited for national broadcast service while frequencies between 6,000 and 30,000 kilocycles are especially useful for intercontinental broadcasting; thus the programs of high-frequency broadcasting stations are usually designed to serve international as well as national audiences. An exception to this rule is recognized in the case of tropical broadcasting stations, which use the high frequencies to overcome atmospheric interference. Among the agreements reached at the International Telecommunications Convention held at Atlantic City in 1326 (1947) is the boundary of the Tropical Zone. Iran lies entirely within this zone and the domestic service has priority over other services with which it shares the bands listed under item 244 of the Radio Regulations promulgated at the Atlantic City Convention.

The plant facilities required to provide acceptable standards of broadcast quality and service are well known with respect to operations on the short and medium waves. The factors affecting broadcast service ranges in the very high frequency band (30-300 megacycles) are not so well known, particularly with respect to meteorological changes (tropospheric propagation) and terrain irregularities.

In the absence of interference from other stations operating on the same frequency or adjacent channels, service ranges under acceptable and recognized standards are determined by the following factors:

The service ranges of all frequency bands are dependent upon and roughly proportional to radiated power.

High frequency broadcasting depends, for all practical purposes, upon ionosphere reflected transmission, and the service range is controlled by the frequency used, the time of day or night and the season of the year. It is characteristic of ionosphere propagation that the signal intensity at any given receiving point is subject to severe fluctuation and the quality is often degraded by distortion. The particular utility of high-frequency

broadcasting comes from the fact that a single station can cover large areas with relatively low power, where it is not possible to furnish economically a more satisfactory service by the use of medium or very high frequencies.

Medium-wave broadcasting in the band 535-1605 kilocycles provides a primary day and night range by means of ground wave propagation. Other conditions being equal the principal factors affecting this primary coverage are ground conductivity and the frequency. Since the ground wave attenuation increases with frequency the lower frequencies of this band provide the larger service areas. This effect is most marked in areas of low ground conductivity, such as are encountered in the major portion of Iran.

In addition, service is provided at greater distances at night in this band by ionosphere propagation. This so-called secondary service has the same character as the high frequencies, but to a less degree with respect to fluctuation of signal intensity and distortion. The signal intensity versus distance of night time propagation in this frequency band is relatively independent over the range of frequencies included therein.

The propagation characteristics of the very high frequency band wave have been discussed previously in this section. Theory predicts and experience confirms that the height of the transmitting and receiving antennas are the most important factors affecting the primary service range. In the absence of terrain irregularities such as hills and mountains the primary service range, provided sufficient power is used, may be about twice the distance to the optical horizon when viewed from the transmitting antenna.

Some service is provided at greater distances, but, due to the changes in atmospheric reflection and refraction with changing meteorological conditions, fluctuations in signal intensity occur. The limit of usefulness of this service is reached when the percentage of time the signal intensity falls below a useable value becomes too great to be tolerated.

Aural broadcasting in the very high frequency band generally employs the new system of frequency modulation invented by Dr. Edwin H. Armstrong, because of its inherent noise-reducing characteristics and capabilities for providing high quality. This system of broadcasting is now generally called FM and has attained public acceptance and wide coverage in the United States where it is allocated in the 88 MC to 108 MC band.

CONCLUSIONS AND RECOMMENDATIONS

FUNDAMENTAL PLAN

Previous discussion has pointed out the restriction on the development of service to the public which results from the activities of separate agencies engaged in the field of telephone service. This form of operation is also uneconomical in the use of natural and manufactured resources and costly in man-power.

It has long been recognized that the telephone service of a country is best developed on the concept of universal service. This concept requires that competitive activities should be avoided where possible and a single agency operating within a complete national territory best fulfills this condition.

The foregoing sections of this report show that the situation existing in Iran today does not conform to the principle of a single national entity for the operation of the internal telephone service of the country.

It is considered desirable at this point to summarize briefly the existing conditions. The Iranian Telephone Company operating under an exclusive concession is authorized to provide all internal telephone services. Under this concession it has developed both local and long distance service. The Ministry of Posts, Telegraphs and Telephones, through the acquisition of copper wire circuits and carrier facilities from the British and American Occupation Forces, has initiated the development of operating a long distance telephone system, as yet unconnected with the local telephone plant, and has planned the expansion of this system into a nation-wide network.

Only two feasible alternatives present themselves for the establishment of a single national entity. They are:

1. A private corporation operating under a concession from the national government.
2. A government agency, presumably the Ministry of Posts, Telegraphs and Telephones.

We recommend the first alternative in order to secure continuity of administrative direction and independence from the general budget requirements of the state. It is evident that the heavy financial obligations imposed on the Government by the Seven Year Plan, as well as the normal budgetary needs of the Government, make it desirable and necessary to attract private capital to many types of endeavor. Private capital is essential for the successful carrying out of the expansion of the telephone services under the Seven Year Plan.

The alternative to private company operation, i. e. operation by a governmental agency such as the Ministry of Posts, Telegraphs and Telephones, is not recommended as it does not offer the advantages of private operation cited above. Also, the government agency has not been engaged in the operation of the general telephone service and is not organized or experienced in that field.

We recommend, however, that the operation of the internal telegraph services of the country, together with the international telephone and telegraph system, marine radio and the broadcasting facilities, should remain under the direction of the Government through the Ministry of Posts, Telegraphs and Telephones. Our reasons for this recommendation are that these activities are a continuation of the present arrangement and that the necessary improvements can probably be adequately carried out by the existing ministry.

It is, of course, essential that the private entity operating the national telephone services should have a general concession for the ownership and operation of the national telephone system and such concession should contain the necessary provisions for reasonable and adequate rates which will permit the continuity of financing to meet the Government and public demand for service. The concession also should make provision for the acquisition by the Government of the properties and services of the private company to be reimbursed by the Government on the basis of a proper appraisal. It would be desirable to fix a reasonable period before the Government can exercise such an option. The present concession of the Telephone Company could be modified or amended to meet these requirements and the company confirmed in the position of the single national entity for the operation of the national telephone services.

The recommendation for the operation of the national telephone services by a single private concessionaire company can be carried out effectively by the acquisition of the plant and facilities of the PT&T which are used or required for the operation of the national telephone service. These facilities would include the copper wire and carrier systems acquired from the British and American military forces and the basic pole line structures along the major highway routes which obviously should be used for the placing of new copper wire circuits and other modern facilities. The initial transfer of such facilities would be followed by subsequent transfers of similar plant, as present facilities used solely for the purposes of telegraph operation become involved in the expansion of the long distance telephone system of the country. Transfers of plant and facilities can be accomplished either by actual transfer of ownership or by lease agreements.

The acquisition of the plant and facilities of the PT&T by the concessionaire company and the subsequently recommended advance of funds by the Plan Organization to the private company for the expansion of both the local and long distance services raises the question as to how the Government should be adequately compensated for these investments. These transactions could be effected or secured by financial participation by the Government in the private company corresponding to the appraised value of the physical plant to be turned over to the private company and the amount of funds to be advanced by the Plan Organization for expansion by the private company during the Seven Year Plan period. The nature of the securities to be issued by the private company would be subject to agreement between the private company and the Government as would the question of suitable guarantees and representation by the Government in the directorate of the private company. The question of whether this financial participation of the Government should be permanent, or amortized by the private company from earnings or other sources, likewise would be dependent upon agreement between the private company and the Government.

We make the following recommendations with respect to the operations of both the PT&T and the Iranian Telephone Company.

1. There should be early introduction of recognized utility accounting procedures. These procedures would establish a system for the recording of all capital expenditures for plant and the application of proper annual charges on plant investment. These annual charges would include interest, taxes, insurance, depreciation and maintenance. There would be rigid adherence to these accounting procedures and particularly in the retirement of plant units through depreciation reserve treatment.
2. Balance sheets should be published after certification by a firm of independent auditors.
3. Legislation should be enacted to control rates and services, providing, however, for an adequate return on the investment.

BASIC STUDIES

In the preceding chapter entitled Systems Design Considerations there are discussed the general technical and economic factors affecting the design of telecommunications facilities. In order, however, to determine the scope of telephone and telegraph service required and to provide essential data for the selection of the type of plant best suited to fulfill requirements, certain basic studies must be made.

Commercial Survey

A commercial survey should be made of the various cities and communities of the country in the order of their importance. Such surveys should evaluate the prevailing economic conditions and the expected trends for a period of at least fifteen years into the future. The expected demand for local telephone service should be forecast for this period, by years if possible, and at least for each five-year period. The forecast for the immediate future should reflect the varying telephone densities which are to be expected in the various sections of the area under study.

From these studies the adequacy of switching facilities required for the central office equipment and the design of the outside plant can be determined.

Loop and Trunk Study

A loop and trunk study should be made for the entire country as soon as possible. This study will indicate the proper limiting standard of transmission loss which should be established for communication between any two subscribers and the allocation of this overall standard to the separate plant components; that is, the subscriber's loop, the inter-office trunks in a multi-office area such as Tehran, and to the long distance circuit. This allocation of transmission loss is dependent upon the related costs of the several plant components and will influence the design of the plant.

Toll Centering Plan

This study is essential for the design of the long distance plant as regards traffic operating layout. In other words this study will determine the location of primary and secondary long distance traffic centers and their subsidiary offices. Such a study is essential to the proper routing of traffic and for the evaluation of the number of circuits required in each circuit group.

Point-to-Point Traffic Study

This study should cover both the long distance telephone and telegraph traffic. It should record the number of telephone calls or telegraph messages completed per day between each two terminal points; that is, the points of origin and destination and the duration of the telephone call in minutes or the number of words in the telegraph message. It should determine the heaviest traffic period of the day, as this factor controls the minimum number of facilities to be provided.

The determination of the number of circuits and the number of switchboard positions or automatic switches required for the handling of traffic is dependent upon this study; also, whether the traffic between any two points should be handled by direct circuits or switched at some intermediate point.

Cost Comparison Studies

There are usually several alternative solutions available for any project under consideration. Comparative cost studies should be made of these several plans in order to determine which is best adapted to and most economical for the project. These studies

usually cover a fifteen-year service period. They should reflect the first cost and annual charges of each plan. The annual charges should include taxes, interest, insurance, depreciation and maintenance.

Such studies are necessary for the selection of the proper type of plant, forecast of the life period for which it is designed, and the future development of the plant to meet the conditions discussed above.

PERSONNEL TRAINING

There is an urgent need for the training of Iranian personnel in the field of communications. The execution of the Seven Year Plan will require the use of modern equipment and operating techniques practically unknown in Iran, which makes it essential that such training be initiated immediately and pushed as rapidly as possible.

This training should embrace the fields of engineering, operation and maintenance. There are many graduates of national and foreign universities in Iran today, and the same plan can be followed with the vocational groups, but the real need is for more intensive training in the national technical schools.

It has become evident that the success of the plan requires the services of foreign experts and that some of these experts are required now. It is appreciated that complete authority cannot be delegated to this staff of experts, but success from their efforts requires that their need be recognized and they be granted all necessary facilities and fully supported in their efforts.

We recommend that foreign experts be engaged for the training of personnel in the construction and operation of the telecommunications plant and services to be developed under the Seven Year Plan. Also, for the sake of continuity in training and performance, an advisory service contract should be negotiated with one of the leading international communications companies which has had long and comprehensive experience in the foreign field.

LOCAL TELEPHONE PLANT AND SERVICE

At the present time Tehran is the only city in Iran with a modern local telephone service. The original 6,000-line system is under process of extension by the installation of 22,000 lines of step-by-step type equipment and associated outside plant. While considerable relief to the present traffic congestion and lack of plant facilities will be afforded by the new plant, there is no doubt that further extension will be required during the Seven Year Plan period, probably as many as 5,000 additional lines.

The plants and services in the remainder of the country are totally inadequate, and generally it can be stated that the magneto switchboards are unserviceable and the principal cities of the country should have automatic service with associated modern toll board facilities for the handling of long distance traffic.

Inasmuch as the program prepared by the PT&T made no provisions for expenditures for telephone plant expansion, it is necessary to determine the means by which such necessary expansion can be financed.

We believe that the development in long distance telephone and telegraph service, international radio communication, broadcasting and miscellaneous services established as the desired objectives under the Plan can be carried out with a lesser expenditure than the Rls. 500,000,000 allocated for this purpose in the Seven Year Plan law. The estimated expenditures for the above services based upon the detailed program of construction presented subsequently in this report amounts to about Rls. 274,000,000. The remainder, while not sufficient to provide all of the local plant expansion considered necessary for the seven year period, would enable a sizable initial program to be carried out.

The factors limiting the number of lines of automatic equipment which can be installed in the seven years are the amount of financing required, the ability of the organization to carry out the program and the training of the personnel to operate the plant and services. We believe that these factors limit the practical program to about 50,000 lines of automatic central office equipment and associated combined long distance and special service switchboards for use in the principal cities of the country. In addition, provision should be made for the replacement of present magneto switchboards with new modern switchboards of the common battery manual and magneto types in the smaller cities and towns respectively.

The total cost of the program proposed for the telecommunication services during the seven year period is estimated at Rls. 511,000,000. As stated above, the sum of about Rls. 274,000,000 is proposed for the provision of long distance telephone and telegraph facilities, international radio communications, broadcasting and miscellaneous services. A sum therefore of about Rls. 237,000,000 could be used for the establishment of modern local automatic telephone service, and it is recommended that this amount be made available to the Telephone Company from the Seven Year Plan funds for the construction of modern automatic local plants in the principal cities of the country, and that this program be completed by the end of the fourth year of the Plan.

The recommended allocation of Rls. 237,000,000 for new local automatic telephone plants will provide such equipment to the extent of about 23,400 lines while the program which is considered essential for the seven year period comprises 50,000 lines of automatic equipment, as discussed previously. The remainder of the proposed program, or 26,600 lines of automatic equipment and associated plant, should be financed by the Telephone Company. To this end, it is essential that the Telephone Company be organized on a sound financial basis in order that it may gain the public confidence and attract the private capital required for plant expansion by the sale of the proper type of securities.

The Telephone Company should also finance a reasonable program of replacement of existing obsolete magneto switchboards and single grounded iron wire outside plant in the smaller cities and towns with plant of modern design. It is believed that the magneto type of service should be retained in those smaller communities because it is most economical and will provide adequate service. However, as the telephone density of any area increases, consideration should be given to the conversion of the magneto service to common battery manual or automatic service.

The program recommended for the establishment of modern automatic local telephone service in the principal cities of the country and to be financed from the Seven Year Plan funds is presented in the following table:

City	Number of Lines	Plan Year of Installation
Meshed	3,000	Second and Third
Isfahan	3,000	Second and Third
Shiraz	2,000	Third and Fourth
Ghum	1,000	Second and Third
Kermanshah	1,000	Third and Fourth
Ahwaz	1,000	Second and Third
Abadan	600	Third and Fourth
Khorram-shahr	600	Third and Fourth
Tehran (Extension)	5,000	Third and Fourth
Tabriz	2,000	Third and Fourth
Resht	2,000	Third and Fourth
Yezd	1,000	Third and Fourth
Hamadan	600	Third and Fourth
Kerman	600	Third and Fourth
Total Lines	23,400	

NOTE: The fact that no installation is completed in the first year of the Plan is controlled by the delivery period for imported equipment and materials.

The above program is shown in Exhibit J-3.

Upon completion of the present installation of the automatic equipment there will be two types in service in Tehran. While this mixed equipment imposes no major technical difficulty in operation, there are disadvantages in the difference in maintenance procedures and in the stocking of spare parts.

It would be preferable to have a single type of equipment in a multi-office area such as Tehran and we recommend that consideration be given to the replacement of the existing Siemens & Halske 6,000 lines by the same type of equipment as is now in process of installation at the time the next extension is made in Tehran. The program outlined above indicates such an extension would be made during the third and fourth years of the Seven Year Plan period.

The existing equipment could be reconditioned after removal and re-installed in one or at the most two other smaller cities where it would suffice without further extension for its expected remaining service life.

As explained previously, this program covers only that portion of the local telephone development which can be financed by Seven Year Plan funds. The funds for the obviously needed additional development in this field, including the replacement of obsolete and worn-out magneto plants with modern plants of the same type, must be financed by private capital and are therefore not included in the Seven Year Plan program. However, it is believed that Rls. 300,000,000 should be considered for this development.

The rendering of a modern telephone service is measured by the reaction of the subscribers and the public to the type of facilities provided for their convenience. An efficient telephone service requires public telephones which are well located for the use of the public. These stations can either be attended stations, in hotels, railroad stations, post offices, banks, etc., where service is handled by a switchboard and attendant, or coin boxes distributed throughout the city area. These public telephones should be established for the placing of both local and long distance calls.

The automatic central office equipment to be placed in service during the Seven Year Plan should be designed and equipped for coin box operation and the initiation of the service should be scheduled at the earliest possible date in each case.

We recommend that the program outlined above for the development of modern automatic local telephone services be carried out as a specific part of the Seven Year Plan program and financed by the allocation of funds from the Seven Year plan.

LONG DISTANCE TELEPHONE AND TELEGRAPH PLANT AND SERVICE

The long distance telephone and telegraph services should be derived from the same basic circuit facilities, requiring consolidation of the pole and wire plants and radio facilities in the interest of economy. For this reason, these services will be dealt with jointly in this discussion. For location of the present long distance lines see Exhibit J-1 and for the proposed lines see Exhibit J-2.

There should be a maximum consolidation of the wire facilities of all communications entities on a single pole line. Major routes should be of steel pole construction. The pole structure of the Iranian State Railways should be used as the consolidated line where the railroad now exists or is projected. On major routes other than the railroad, the existing steel pole lines of the PT & T should be the consolidated pole lines for all public communications. Steps should be taken to co-ordinate the new construction activities of the several communications agencies.

The wire circuit facilities of both the PT & T and the Telephone Company should be derived from the same basic circuits. The question will naturally arise regarding the equitable distribution of ownership of these facilities. The specific solution of this problem is not within the scope of this report, but the following methods have been used successfully in the communications business:

1. Joint ownership of the pole structure by the several entities involved.
2. The ownership of the pole structure by one of these entities, and charges to the others for occupation of the pole structure by facilities owned by them.
3. The leasing of wire, radio or carrier channels by the owning entity for the use of other entities. Such an arrangement should be considered between the PT&T and the Telephone Company. The rental in such cases is based on the equitable share of the annual charges on the combined pole and wire structure. For the purpose of this study, it is assumed that all funds are to be provided by the Seven Year Plan organization regardless of the entity having ownership of the property.

Further recommendations pertaining to the outside plant operation and maintenance follow:

1. There must be national laws and enforcement of them for the protection of the telecommunications plant and particularly as regards copper wire pilferage.
2. The present practice of maintaining outside plant by use of repairmen on horseback or even on foot exclusively should be superseded as soon as possible by the use of properly-equipped motor vehicles. In the case of the facilities located along the railroad right-of-way the use of motor speeders offers a rapid and economical method of maintenance. In this latter connection, the railroad should be responsible for the maintenance of all wire facilities carried on its pole lines.

3. The carrier terminal equipment should be located in the carrier or repeater station of the Telephone Company and the telegraph legs carried from this equipment to the telegraph offices. This is the preferred arrangement as it is inevitable that in future years the Telephone Company will generally have its own separate pole and wire structures and there is a real economy in having one entity responsible for all operation and maintenance of this type of equipment.

4. The salvaged wood poles and iron wire resulting from the consolidation of duplicate lines should be used for the construction of branch and subsidiary lines from main telegraph and telephone centers. The circuits on such lines should be metallic telephone circuits which can be simplexed for telegraph operation. However, consideration should be given to the use of "Telefonogram" service over these circuits in order to avoid the cost of extra personnel and telegraph equipment.

We recommend that the PT&T as soon as possible establish short-wave radio telephone and telegraph communication between 12 of the principal cities of Iran and Tehran. We recommend that 1-kilowatt short-wave transmitters be established in Ahwaz, Tabriz, Shiraz, Kerman, Zahidan, Meshed, Yezd and Sanadaj and that 300-500 watt short-wave transmitters be established in Isfahan, Hamadan, Resht and Gurgan; also, seven 1-kilowatt short-wave transmitters should be established in Tehran to communicate with the cities above.

INTERNATIONAL TELEPHONE AND TELEGRAPH FACILITIES AND SERVICE

We recommend that PT&T establish the facilities for and provide the international telephone and telegraph service. Contingent upon the rehabilitation and placing in service of the 7½-kilowatt RCA and 30 kilowatt Telefunken transmitters at the Tehran station for telegraph service, we believe that the needs of this service are adequately met for a long period of time.

We believe that the new Standard Telephones and Cables Company radio telephone transmitter, even if released from all broadcast schedules, will not provide all the international telephone service that will be needed. This conclusion is based in part upon the estimated need for direct telephone facilities to both North and South America through New York and either Lima or Buenos Aires. Furthermore, in order to establish such new direct connections and to continue service with London and Berne it is probable that single side band transmission will have to be provided.

We, therefore, recommend that a new high power, single side band, 3-voice-channel radio telephone transmitter be provided, together with the associated receiver and antenna accessories.

In this connection it is our opinion that the present transmitter site is not favorable to transmission along the Berne, London, New York great circle paths, due to the proximity of the Elborz range of mountains. A new site is recommended for this transmitter.

We recommend that the present facilities at the Tehran transmitting station be released from all broadcasting schedules and that they be used to provide all international telegraph and double side band telephone service.

BROADCASTING PLANT FACILITIES AND SERVICE

The present broadcast facilities in Iran are not considered adequate for public interest, convenience and necessity. With the limited facilities now used it is impossible to provide either national or regional broadcast service of acceptable standards. One very important result is that the people are influenced to listen to the programs from foreign countries which provide better reception and more interesting subjects. At the same time this condition aids the efforts of unfriendly nations to use effective propaganda through the medium of broadcasting. In addition to the general public need, improved facilities will be of enormous assistance in attaining the objectives of the Plan through the dissemination of information concerning social reform, education, public health, agriculture and industry.

In order to accomplish the desired results we recommend that PT&T provide a broadcast service which will reach all areas of the country both day and night. This can be achieved economically only by utilizing ionosphere propagation for both day and night service to rural areas.

From the standpoint of propagation only the best results will be attained by utilizing both short- and medium-wave facilities. It appears that the atmospheric interference in Iran does not preclude effective use of medium-wave service, particularly at night during the winter months when service from short waves is poorest.

When, however, broadcast channels are shared by two or more stations, the service range via ionosphere transmission may be severely restricted or wiped out completely by mutual interference. The effective utilization of ionosphere propagation for national (or international) coverage is, therefore, contingent upon the availability of radio frequency channels which are free from interference. With respect to short-wave band, allocations are a matter of international agreement and with respect to the medium-wave band are a matter of national and regional agreement.

Both short- and medium-wave allocations are restricted by the availability of channels assigned to the broadcast services by international agreement in accordance with the needs of all countries. The scope of this survey does not permit a detailed analysis of world-wide allocations and recommendations with respect to specific channels for Iran. This is a matter requiring further study. We believe, however, that the development of broadcasting among the nations contiguous to Iran will permit, for the foreseeable future, the use in Iran of both short- and medium-wave channels sufficiently free from interference from other stations to develop on these channels wide range service both day and night.

If it is found after more detailed study that this is not the case, there is only one alternative. This is to establish the national broadcast service in the very high frequency band. The use of frequency modulation (FM) in the already developed band of 88-108 megacycles would virtually prevent interference originating beyond the borders of the country.

While FM would furnish a service of higher quality and free from static, it would not be economically feasible to provide rural coverage and the service would be restricted to the principal cities and the nearby surrounding territory. Under such restrictions the value of the national broadcast service in Iran would be severely curtailed.

Furthermore, the use of FM exclusively would make obsolete all existing receivers for reception of domestic broadcasting, and since the FM receiver is more costly to manufac-

ture than those for short- and medium-wave bands its introduction would place an additional economic burden on the country.

We believe it to be technically and economically sound to provide the following facilities described below and located as shown in Exhibit J-4:

Tehran

Establish a new broadcasting transmitter site and install one 20-kilowatt short-wave broadcasting transmitter and one-50 kilowatt medium-wave (standard band) transmitter. The high power short-wave transmitter would provide an acceptable day-time service over the whole country except within the normal skip distance of the frequency used. It would also provide an adequate facility for international broadcasting and one commensurate with the prestige and world importance of Iran. The domestic night-time service by short-wave broadcast is not considered to be acceptable for nation-wide coverage. Interference, fluctuating signal intensity and selective fading are greater on the usable night-time frequencies than during day-time, and the service is far below the day-time standard.

The present site of the Tehran broadcast stations is poor for medium-wave broadcasting. The principal defect is the very poor ground conductivity. The proposed 20-kilowatt short-wave and the 50-kilowatt medium-wave broadcast transmitters should be situated at the same site and occupy the same buildings as the proposed 20-kilowatt radio telephone transmitter.

A site should be secured in a southwesterly direction, and at a distance of not more than 20 miles from Tehran, where the ground is moist at all seasons and where it appears that maximum ground conductivity can be found in this vicinity. The proposed site would probably avoid the undesirable effects from the Elborz range on the Berne, London, New York short wave telephone transmission.

The economies in providing land, buildings, power-supply and housing common to all facilities is considerable and there do not appear to be any technical difficulties in the operation of these facilities from the common site.

The high power medium-wave broadcast station will provide an excellent primary service in Tehran and in general provide an acceptable primary daytime service over the area within the skip distance of the short-wave broadcast station. At night this station will provide the best possible sky wave secondary service over the whole country.

New broadcast studios should be provided. Since it is proposed that the broadcast transmitting facilities be established at a new site relatively remote from the city, it is necessary to have the new studios more conveniently located, preferably near the center of Tehran. This matter is discussed further under a heading entitled "Buildings".

Ahwaz, Tabriz, Shiraz, Kerman, Zahidan, Meshed, Yezd, Sanandaj, Isfahan, Hamadan, Resht, Gurgan

The above cities, because of their political importance, size and location with respect to populated areas, should have broadcast outlets capable of providing a local and limited regional service. We recommend that each city listed be provided with a

one-kilowatt medium-wave transmitter and suitable studio facilities to meet local and regional programming needs.

Rezaiyeh, Kermanshah, Babul

These cities should be provided with local broadcast outlets. We recommend that the three Telefunken 100-watt broadcast transmitters purchased before the war be installed in these centers.

It is desirable to inaugurate the medium-wave broadcast facilities listed above as soon as possible. The service these stations will provide will be superior in quality to that now received in the regions in question via sky-wave transmission from Tehran. Home receivers for these stations can be purchased at less cost than those capable of long distance short-wave reception. By proper programming it will be possible to direct the listening habits of the country to domestic programs, an important step in the unification and development of Iran.

All stations outside of Tehran should have the necessary receiving facilities to permit programs from Radio Tehran to be rebroadcast locally.

MARINE RADIO

We recommend that marine radio station facilities of 300-500 watts power be established by PT&T for communication with shipping at the following ports: Khorramshahr, Bandar Shahpur, Bushire and Bandar Shah.

BUILDINGS

This matter is dealt with separately because it was treated in this manner in the Provisional Planning Board recommendations. In that report all proposed building requirements for both the posts and telecommunications services were combined. That report did not make clear how the building costs were to be shared between these two services, although the total allocation of Rls. 750,000,000 under the Act designates Rls. 250,000,000 for posts and Rls. 500,000,000 for telecommunications.

The Board's report recommends that a total of Rls. 238,000,000 be spent on new buildings, about Rls. 200,000,000 of which are for a new Ministry of Posts, Telegraphs and Telephones building in Tehran and 180 new post offices in as many cities. It appears that a portion of the cost of these post office buildings was to be obtained from the Rls. 500,000,000 allocated to telecommunications.

We are not directly concerned with post office facilities, although it is recognized that the telegraph services occupy the same buildings. While it is true that there are cases, notably in Tehran, where the present buildings are inadequate, it is felt that, in general, the construction of new buildings is not justified at this time by the telegraph service needs. It is not considered that the proposed new administration building should include a new telegraph center of operations in Tehran, or schools, laboratories and broadcast studios. We recommend that these facilities be provided by other means

and that a new administration building, if necessary, be financed out of the normal budget appropriations. We recommend that the schools and laboratories necessary for training personnel in connection with telecommunications be established in collaboration with existing educational institutions, such as the University of Tehran, and that the teaching staff and present facilities should be utilized to the fullest extent.

We recommend that a new building be constructed for a new telegraph central operating headquarters in Tehran. The estimated cost of this building and new equipment installation is included in the proposed program.

We further recommend that new broadcast studio facilities be provided in Tehran. A new building is favored, but consideration should be given to the development of space in existing buildings. By taking full advantage of portable remote pickup equipment for programs outside of the studio, building requirements and control equipment need not be costly. The estimated costs of adequate studios are also included in the proposed program. The estimated costs of all other purchases of land and building construction costs involved in the program submitted are included also.

ORGANIZATION AND IMPLEMENTATION

ORGANIZATION

It is desirable to give more detailed consideration to the organization required for the effective implementation of the recommendations presented and discussed in the foregoing chapters. This subject will be discussed under the following headings, which denote the principal agencies involved in the extension of the telecommunications services under the Plan:

Private enterprise
Government
Foreign advisory service

Private Enterprise

As stated previously, we recommend that the establishment and operation of the domestic telephone services, both local and long distance, be undertaken by private enterprise. The present Iranian Telephone Company, operating under the existing concession, is not considered to possess all the qualifications necessary for the proposed organization; neither is the present concession considered satisfactory from the standpoint of public and investor interests.

Two methods of dealing with this problem are presented for consideration. In the first case a new company could be formed to operate under a new concession. This new company would take over the plant and assets of the present organization. In the second case the present company could be reorganized under a new concession or with the present one modified or amended.

The new or reorganized concessionaire company should be classified as a public utility and should be subject to regulation with respect to service to the public, rates for service, financial procedure and performance.

Government

Previously we recommended that the Government, through the Ministry of Posts, Telegraphs and Telephones, should provide the domestic telegraph service, and establish

the facilities for and provide the international telegraph, telephone, and broadcast services. We recommended that consolidation of telegraph and telephone outside plant facilities be effected between the PT&T and the Iranian State Railways. The problems that may arise from the carrying out of these proposals do not appear to require organization changes or additions in the Government agencies concerned, other than will be provided by the Plan Organization.

Foreign Advisory Service

In comparison with general progress in the industry, the development of the telecommunications facilities and services in Iran has been deficient in varying degrees among the several types of service. In providing extension of the communications facilities under the Plan, technically and economically sound considerations require the application of the most modern plant and the best tested and proven operational procedures.

To provide the technical, administrative and operational knowledge and experience that must be applied to the solution of the complex problem of development and extension of the communications system, advisory service assistance will be required from foreign experts.

This service, to be of maximum value, must embrace all phases of the telecommunications art. The purpose and scope of the services that should be secured and the advantages that will be derived therefrom are as follows:

Purpose

An advisory service contract provides a service of an advisory nature which is rendered by a qualified company or organization to the management of an enterprise, in this case the communications agencies operating in Iran. Under such a contract the company supplying the advisory service would provide a staff of experts to work with the management of the particular organization contracting for such service.

The amount of authority to be delegated to the advisory service group will be dependent upon the policy of the government or private agency contracting for the service. In any event, the successful functioning of an advisory service group requires unqualified recognition of the need for its services and the support (and protection) of the group in the performance of its duties.

Scope

The services afforded under an advisory service contract to either or both of the entities engaged in the rendering of public communications services in Iran, namely, the Ministry of Posts, Telegraphs and Telephones and the Iranian Telephone Company, should embrace the following functions of the business:

1. Administration.
2. Financial performance.
3. Accounting procedure and statistical recording of results.
4. Budgetary procedure and control of expenditures.
5. Engineering technique.
6. Engineering direction of long-range planning and the specific work currently in progress.
7. The direction of departmental operations. In this case, experts would be available for work in the following phases of operation:
   a. New plant construction.

b. Operation and maintenance of the physical plant and services.

c. The commercial activities of the enterprise, embracing public relations; evaluation of the present level of development and the forecasting of future trends and demands; rate structures and billing and collection procedures.

d. The traffic operation of the plant and services; in other words, the usage of the plant facilities to accommodate maximum traffic flow and secure maximum revenues.

e. The training of Iranian personnel in the engineering and technical fields and in the vocational duties pertaining to each department.

Under this contract the supplier of the advisory services would make available the complete engineering technique and operating practices and procedures which have been developed and established as the result of experience in international operations. This service would cover the following fields:

1. International radio, wire and cable communications in both telephone and telegraph operation.
2. Internal or national long distance radio, wire and cable communications in both telephone and telegraph services.
3. The operation of local telephone systems in the various cities of the country.
4. Information on new inventions applicable in the field of telecommunications.

We recommend that an immediate step in the implementation of the Plan with respect to telecommunications be the negotiation of an advisory service contract between each agency providing communications service, and an agency or organization qualified to fulfill the requirements presented in the foregoing.

IMPLEMENTATION

Objectives

The broad objectives that can be attained in the development and extension of telecommunications to meet the national needs within the scope of the Plan are as follows:

1. The establishment of a backbone network of telephone and telegraph facilities connecting the principal cities of the nation. This basic network will provide telephone circuits of recognized and acceptable quality of speech reproduction and transmission standards. This network will be capable of future expansion as the needs of the country may require. As construction of this basic network proceeds, it will be possible in many cases to connect existing telephone circuits and extend the range of telephone communication beyond the principal cities served. This network will provide telegraph service using the most modern equipment and procedures to transmit the messages. In this connection, the use of teletype and teleprinters with reperforators and tape relay and distribution operating procedures is planned. Over this basic network the telegraph service will, for the most part, be derived from the copper wire line and telephone carrier facilities. It is contemplated that the capacity of the existing plant beyond this basic network will be increased many fold, where necessary, by the use of carrier telegraph.
2. The extension of the basic network of telephone and telegraph facilities to a limited number of subsidiary and rural centers.

3. The installation of a total of 50,000 lines of automatic central office equipment and associated outside plant among the principal cities of the nation.
4. The establishment of radio communication facilities in the following cities and Tehran, thereby linking these cities with Tehran with telephone and telegraph service at the earliest possible date: Ahwaz, Tabriz, Shiraz, Kerman, Zahidan, Meshed, Yezd, Sanandaj, Isfahan, Hamadan, Resht, and Gurgan. These facilities are considered satisfactory for some time to come to provide normal telegraph service using teleprinter equipment with tape relay and distribution operating procedures. The telephone service that can be provided will not meet acceptable standards of reliability and quality for ultimate normal use and this service will be carried over the wire line networks as soon as they can be extended to the above cities. This radio network will provide emergency facilities to supplement the projected basic wire line network in case the services it carries are interrupted.
5. The establishment of additional international telephone and telegraph facilities, to meet the estimated traffic requirements and provide modern equipment that will be acceptable for direct connection with Europe, North and South America in the near future.
6. The establishment of new high-power broadcast stations in Tehran on both short and medium waves and about 12 medium- and low-powered medium-wave broadcast stations in the principal cities throughout the country. This broadcast service is considered an essential facility for the implementation of the whole Seven Year Plan.
7. Establish marine radio stations at Khorram-shahr, Bandar Shahpur, Bushire and Bandar Shah.

Construction

The program of procurement and construction that is recommended to attain the broad objectives outlined in the foregoing section is presented in Appendix J-1. It must be recognized that the actual implementation will probably depart from the exact plant facilities and procedure outlined here. It is felt, nevertheless, that subsequent studies and more detailed consideration of the problem will not change the basic concepts underlying this plan nor change materially the objectives or the cost of attaining them.

There are 22 separate projects included in the recommended Seven Year Plan program which provide for the construction of new pole lines or the rehabilitation of existing pole lines and the placing of new copper wire circuits with superimposed carrier facilities on these pole lines. These projects are described individually in Appendix J-1, Nos. 1 to 22, and are indicated on the map shown in Exhibit J-2.

These combined projects embrace the construction or installation in the following major categories of plant:

1. Approximately 48,000 steel rail or steel tube poles. The steel rail poles should be supplied by the ISR. The steel tube poles will be made available by consolidation of pole lines of the PT&T.
2. Approximately 8,000 kilometers of copper wire circuit (2 wires).
3. Approximately 4,200 kilometers of three-channel telegraph carrier systems.
4. Approximately 4,200 kilometers of multi-channel telegraph carrier systems.
5. Approximately 3,200 kilometers of single channel telephone carrier systems.

6. Approximately 3,200 kilometers of single channel telegraph carrier systems.
7. Approximately 5,000 kilometers of wood pole line with one metallic (2 wires) iron wire circuit. These lines can be constructed from salvaged wood poles and iron wire which can be made available by consolidation of parallel pole lines of the PT&T and the Telephone Company.

The above newly-constructed plant will provide the following circuit facilities:

1. Approximately 24,000 kilometers of copper wire and carrier telephone circuits.
2. Approximately 5,000 kilometers of metallic iron wire telephone circuit.
3. Approximately 28,000 kilometers of telegraph carrier circuit. In addition, a great number of kilometers of simplex telegraph circuit can be established on the new copper and iron wire circuits.

There are also 22 additional projects covering our recommendations in radio telephone and telegraph, broadcasting, educational and miscellaneous categories. These projects are described in Appendix J-1, Nos. 23 to 44.

Cost Estimates

The estimated cost of the work comprised in these projects is summarized in Exhibit J-5.

POST AND POSTAL TRANSPORT SERVICE

The administration of the post and postal transport service has been solely the duty of the Government through the Ministry of Posts, Telegraphs and Telephones.

In the course of our inspection of the telecommunications system we visited the post offices in Tehran and many of the principal cities, and discussed the postal services with the Chief of the Post and Telegraph Administration and other Government and industry representatives. It was our general observation that the scope, speed and reliability of the postal services have not developed in proportion to the country's needs. This service must be expanded and improved concurrently with the development of the Iranian economy under the Seven Year Plan.

As the facts of the postal service were well known and it would have been necessary to make a detailed study for the purpose of recommending corrections, it was agreed between the Provisional Planning Board, the Minister of Posts, Telegraphs and Telephones, and representatives of Overseas Consultants, Inc., that this detailed study should be made as part of the execution of the Plan.

We recommend, therefore, that a recognized expert in all phases of postal activities and organization be retained as soon as possible for work in connection with the implementation of the Seven Year Plan, and that under his direction the post and postal transport service should be modernized in scope, speed and reliability. As we have not made a specific study of this problem, we have no opinion on the timing of any expenditures or the funds required. We recommend that the sum of Rls. 250,000,000 provided in the Plan Act be considered a tentative allocation for this purpose until more detailed information is available.

APPENDIX J-1

CONSTRUCTION PROJECTS

Nos. 1 & 2—TEHRAN—SHAHRUD—MESHED

This project is so planned that the Tehran-Shahrud section would be carried out during the first year of the plan and the Shahrud-Meshed section during the second year. The project is based on the consolidation of all paralleling pole and wire facilities on a single pole line. The project would be carried out as follows:

Tehran—Shahrud—First Year

In this section there are the following pole lines which generally parallel each other:

1. The steel pole line of the Iranian State Railways (ISR) which is located along the right-of-way.
2. A wood pole line of the PT&T carrying two iron wires (ISR).
3. A wood pole line of the Telephone Company (ISR).

The work should be carried out in the following order:

1. Purchase two combined 3-channel speech and 6-channel telegraph carrier systems (four terminals) for delivery by the end of the first year of the plan. Purchase a carrier repeater for Shahrud.
2. Place two new copper circuits from Tehran to Samnan and one new copper circuit from Samnan to Shahrud, using the present poles of the ISR in both sections. The one copper circuit from Tehran to Shahrud will be used for the operation of the proposed carrier systems, and the other copper circuit will be used for long distance telephone and telegraph traffic between Tehran and Samnan and for traffic switched at Tehran to points beyond Tehran.
3. Install two terminals of the above carrier system in Tehran and Shahrud and place the system in service over the new copper wire circuit.
4. Dismantle and salvage the wood poles and iron wires for re-use in the construction of branch and subsidiary lines.

Shahrud—Meshed—Second Year

In this section there are the following pole lines:

1. A wood pole line of the PT&T which carries two iron wires.
2. A wood pole line of the Telephone Company, which carries one iron wire. This pole line extends only in the section between Sabzavar and Meshed.

The work should be carried out in the following order:

1. It has been suggested to the ISR that the pole line required for its operation be built in advance of the railroad construction and during the first year and early part of the second year of the Plan. The pole line should be built with salvaged steel rails, or if these are not available the steel poles salvaged from the lines of the PT&T can be used for this purpose.

2. Place one new copper circuit from Shahrud to Sabzavar and two copper circuits from Sabzavar to Meshed, using the poles of the ISR in both sections. Install two terminals of the above carrier system in Shahrud and Meshed and place the system in service over the one copper circuit from Shahrud to Meshed. The other copper circuit will be used for the handling of telephone traffic from Sabzavar and Nishabur to Meshed and to points beyond Meshed. Install the carrier repeater in Shahrud.

3. Dismantle and salvage the wood poles and iron wire for re-use in the construction of branch and subsidiary lines.

No. 3—KASHAN—ARDISTAN—ISFAHAN—SHIRAZ—BUSHIRE

This project provides for the placing of one new copper circuit on the present steel PT&T pole line Kashan to Bushire, via Ardistan, Isfahan and Shiraz. It also provides for the installation and operation of two combined 3-channel speech and 6-channel telegraph carrier systems and one single-channel speech carrier system over the new copper circuit. One of these two combined speech and telegraph carrier systems is to be covered under the Tehran-Kashan project (No. 5) to be carried out in the first year of the Plan. The second of these systems together with the single-channel speech carrier system should be purchased at the beginning of the second year of the Plan for delivery as early as possible in that year.

Further detailed study should be given to the proper locations of the terminals of the two combined speech and telegraph carrier systems. Under the Tehran-Kashan project, it is assumed that one terminal will be located in Tehran and the second terminal of that system temporarily in Kashan. However, if the second terminal later can be located in Ardistan, the system can be used in common for the extension of facilities to the southeast to Yezd and Zahidan and to the south to Isfahan and Bushire. It is assumed for the purpose of this project that the second terminal will be located in Ardistan. The first terminal of the second system likewise will be located in Ardistan and the final terminal in Isfahan.

The work should be carried out during the second, third and fourth years of the Plan in the following manner:

1. Purchase a combined 3-channel speech and telegraph carrier system, two terminals with the necessary intermediate repeaters and a single-channel speech carrier system.

2. Place a new copper circuit on the present PT&T steel pole line from Kashan to Bushire.

3. Install one terminal of the combined speech and telegraph carrier system in Ardistan and the other in Isfahan. Place this system in operation upon completion of the new copper circuit between Ardistan and Isfahan.

4. Install one terminal of the single-channel speech carrier system in Isfahan and the other in Shiraz upon completion of the new copper circuit in that section.

5. The service now operated over the wood pole line and iron wire of the Telephone Company should be transferred to the new copper wire or speech carrier systems and the wood poles and iron wire salvaged for re-use in the construction of branch and subsidiary lines. This consolidation work can be started in the third and completed in the fourth year of the plan.

No. 4—ARDISTAN—ZAHIDAN

This project provides for the placing of a new copper circuit on the existing PT&T pole line between Ardistan and Zahidan. It also provides for the operation of speech and telegraph carrier systems over the new copper circuit. The construction and installation work should be carried out during the second and third years of the Plan. The consolidation of parallel pole lines of the Telephone Company with the new copper circuit and carrier facilities could be initiated in the third year and completed in the fourth year of the Plan.

The work covered by this project should be carried out in the following manner:

1. Purchase a combined 3-channel speech and 6-channel telegraph carrier system (two terminals) at the beginning of the second year of the Plan; also purchase four terminals of a single-channel speech carrier system at the same time.
2. One voice frequency cord circuit repeater, carrier type glass insulators and pole fittings and brackets should be purchased in the first year of the Plan to permit initiation of construction at the beginning of the second year of the Plan.
3. Place a new copper wire circuit on the existing steel pole line between Ardistan and Zahidan.
4. Install and place in operation the combined 3-channel speech and 6-channel telegraph carrier system with one terminal each in Ardistan and Yezd.
5. Install and place in operation the single-channel speech carrier systems with one terminal in Yezd, two terminals in Kerman and one terminal in Zahidan. Install and place in operation the cord circuit repeater in Kerman.
6. Transfer all service from paralleling wood pole lines and iron wires of the Telephone Company to the new copper wire and carrier systems.
7. Dismantle and salvage the wood pole lines and iron wires of the Telephone Company for re-use in the construction of new branch and subsidiary lines.
8. Consider the transposition of two of the present three iron wires on the existing steel pole line to form a metallic telephone circuit which can be used for the handling of terminal traffic between adjacent intermediate offices.

No. 5—TEHRAN—KASHAN

Tehran—Ghum

In this section there are the following pole lines:

1. A steel tube pole line of the PT&T carrying four iron wires.
2. A steel tube pole line of the PT&T carrying three iron wires.
3. A wood pole line of the Telephone Company carrying one iron wire.

It is proposed to consolidate the facilities on the three above lines onto the single pole line (1) and dismantle the other two lines and supported wires. The steel poles from line (2) will be salvaged and re-used for new pole lines projected during the Seven

Year Plan. These poles should be reserved for possible use in the new line project between Shahrud and Meshed during the second year of the Plan (Project No. 2). The wood poles and iron wires removed should be stocked at logical points for the projected construction of branch and subsidiary lines.

It is proposed to effect the consolidation in the following manner:

1. Place one new copper circuit on line 1 above.
2. Purchase a multi-channel telegraph carrier system of at least six channels early in the first year.
3. Purchase simultaneously a 3-channel speech (telephone) carrier system which is proposed for installation during the second year between Tehran and Ardistan.

Ghum—Kashan

In this section there are the following pole lines:

1. Two separate PT&T steel tube pole lines each carrying three iron wires.
2. One wood pole line of the Telephone Company carrying one iron wire.
3. It is expected that the ISR will construct a new steel rail pole line along the right-of-way between Ghum and Kashan in such time that new copper wire can be placed on it by the end of the first year of the Seven Year Plan.

It is proposed to consolidate the existing pole lines in their sections as follows:

1. Place one new copper circuit on the new pole lines of the ISR.
2. Install the multi-channel carrier telegraph terminals in Tehran and Kashan and place these facilities in service between the two cities. Subsequently, when the new copper circuit has been placed in service between Tehran and Ardistan, the two terminals of the 3-channel speech carrier system should be installed in Tehran and Ardistan and the multi-channel telegraph carrier system terminal previously installed in Kashan should be moved to Ardistan.
3. Remove all three pole lines and iron wires listed under 2 and 3 in the Tehran-Ghum section and 1 and 2 in the Ghum-Kashan section. The steel poles should be earmarked for re-use on the new pole line to be constructed between Shahrud and Meshed during the second year of the Plan.

No. 6—TEHRAN—KAZVIN

This project is designed to be carried out in the first year of the Plan and covers the consolidation of parallel pole lines of the PT&T and the Telephone Company on a single steel pole line of the PT&T. In this section there are the following pole lines:

1. A steel pole line of the PT&T which carries six copper and two iron wires.
2. A steel pole line of the PT&T which carries four iron wires.
3. A wood pole line of the PT&T which carries four iron wires.
4. A wood pole line of the Telephone Company which carries three iron wires between Tehran and Karaj and two iron wires between Karaj and Kazvin.

The work should be carried out in the following manner:

1. Purchase a combined 3-channel speech and 6-channel telegraph carrier system for delivery as early as possible in the first year of the Plan.
2. Install the two terminals of the above systems, one each in Tehran and Kazvin and place the system in service over one of the existing copper circuits carried on line 1 above.
3. Transfer all service from pole lines 2, 3 and 4 above to pole line 1 above and salvage poles and wires from pole lines 2, 3 and 4 for re-use; the steel poles should be reserved for use on the projected pole line to be constructed between Shahrud and Meshed during the second year of the Plan and the wood poles used for the construction of branch and subsidiary lines.

No. 7—TABRIZ—JULFA

This project covers the placing of a new copper circuit on the existing steel pole line of the PT&T and the subsequent consolidation of the wood pole line and iron wire of the Telephone Company. This project should be deferred until the last two years of the Plan.

No. 8—KAZVIN—TABRIZ

This project is a continuation of the Tehran Kazvin project (No. 6) proposed for execution the first year of the Plan. This project provides for the placing of a new copper circuit on the existing poles of the PT&T and the installation and operation of speech and telegraph carrier systems over the new copper circuit. The construction and installation work should be carried out during the second and third year of the Plan. The consolidation of parallel poles and wire lines should be initiated in the third year and completed in the fourth year of the Plan.

The work covered by this project should be carried out as follows:

1. Purchase the copper wire carrier type glass insulators and associated materials required for the line construction.
2. Purchase a combined 3-channel speech and 6-channel telegraph carrier system at the beginning of the second year of the Plan.
3. Place a new copper circuit on the existing pole line of the PT&T.
4. Install and place in operation the carrier system referred to under 2, one terminal each in Kazvin and Tabriz.
5. Consolidate the parallel pole and wire lines by the transfer of all services to the pole line carrying the new copper wire and carrier facilities. Remove all other pole and wire lines and salvage the wood poles and iron wires for re-use in the construction of new branch and subsidiary lines.
6. Transpose two existing iron wires on the retained steel pole line, forming a metallic telephone circuit which can be used for telephone service between adjacent intermediate points.

No. 9—TABRIZ—KHOY—REZAIYEH

This project provides for the construction of a new steel pole line which will carry one new copper circuit. Two single-channel speech carrier systems and one speech plus duplex carrier telegraph system should be superimposed on the copper circuit. The

initiation of service should be followed by the consolidation of the parallel wood pole line and iron wire of the Telephone Company and dismantling of this line and the similar line of the PT&T. The salvaged wood poles and iron wire should be re-used for the construction of new branch and subsidiary lines.

The work should be carried out in the fourth and fifth years of the Plan and in the following order:

1. Construct new pole line of salvaged steel rails.
2. Place a new copper circuit on the new pole line.
3. Purchase four single-channel speech carrier terminals and two speech plus duplex telegraph carrier terminals.
4. Install one speech carrier terminal in Tabriz, two in Khoy and one in Rezaiyeh.
5. Install one speech plus duplex carrier telegraph terminal in Tabriz and one in Khoy.
6. Transfer services from parallel wood pole line and iron wire of the PT&T and the Telephone Company to the new pole line and copper wire and carrier systems.
7. Remove all wood poles and iron wire and salvage for re-use in the construction of new branch and subsidiary lines.

No. 10—KAZVIN—RESHT—PAHLEVI

This project provides for the construction of a new pole line between Kazvin and Pahlevi via Resht, using salvaged steel rails to be secured from the ISR. A new copper wire circuit should be placed on the new pole line. This project is proposed to be carried out during the fifth and sixth years of the Plan.

The services operating over present parallel wood pole lines and iron wires of the PT&T and the Telephone Company would be transferred to the new copper wire circuit. The wood pole lines and iron wire should be removed and salvaged for re-use in the construction of new branch and subsidiary lines.

No. 11—TABRIZ—BEZARGEN

This project provides for the construction of a new steel pole line carrying one copper circuit between Tabriz and Bezargen. The poles should be salvaged steel rails to be supplied by the ISR. The project is proposed for the last year of the Plan. The present wood pole line and two iron wires of the PT&T should be removed and salvaged for re-use in the construction of new branch and subsidiary lines.

No. 12—TEHRAN—CHALUS

This project provides for the placing of two copper circuits, four wires on the existing steel poles of the PT&T between Tehran and Chalus. The work should be carried out during the fourth year of the Plan.

This route should be used as an alternative route for carrier system operation between Tehran and Tabriz via Resht and Ardebil and between Tehran and Shahi to Gurgan when the basic copper circuits on normal carrier routes are interrupted.

No. 13—TABRIZ—ARDEBIL—ASTARA

This project provides for the construction of a new steel pole line from Tabriz to Astara via Ardebil and the placing of one copper circuit on the new pole line. The poles should be salvaged steel rails to be supplied by the ISR. The work should be carried out during the last two years of the Plan.

The services in operation over the existing wood pole lines and iron wires of the PT&T and the Telephone Company should be transferred to the new copper circuit. The existing wood poles and iron wires should be removed and salvaged for re-use in the construction of new branch and subsidiary lines.

This route should be used as an alternative route for the operation of carrier systems between Tehran and Tabriz via Chalus, Resht and Ardebil when the normal route is inoperative.

No. 14—TEHRAN—SHAHI—GURGAN

This project provides for the placing of a new copper circuit on the poles of the ISR between Tehran and Shahi and between Shahi and a point to within approximately 40 kilometers of Gurgan. From this point a new steel pole line and one copper circuit should be constructed to Gurgan using salvaged steel rails to be supplied by the ISR. A combined 3-channel speech and 6-channel telegraph carrier system should be placed in operation between Tehran and Shahi. A single channel speech carrier system and a speech plus duplex carrier telegraph system should be placed in operation between Shahi and Gurgan, and similar systems should be placed in operation between Shahi and Babulsar.

The construction and installation work should be carried out during the second and third years of the Plan. The removal of the parallel wood poles and iron wires between Tehran and Shahi should be carried out during the fourth year of the Plan. The salvaged wood poles and iron wire should be re-used in the construction of new branch lines.

Between Shahi and Gurgan there are the following pole lines:

1. A wood pole line of the PT&T which carries two iron wires and two copper wires.
2. A wood pole line of the Telephone Company which carries one iron wire.

These pole lines and wire should be removed after the tranfer of service to the new copper circuits and carrier systems described above. The salvaged materials should be used for the construction of new lines, the copper wire reserved for re-use on major route projects.

The Plan prepared by the PT&T did not contemplate this project. However, our studies disclose that it is of great importance in providing high-grade facilities in a very important area; also, this route can be used as an alternative route to points along the Caspian Sea as far as Resht and even to Tabriz when normal routes are inoperative.

The work proposed under this project should be carried out in the following order:

1. The copper wire carrier-type glass insulators and associated appliances should be purchased at the beginning of the second year of the Plan.
2. The carrier systems specified above should be purchased at the beginning of the second year of the Plan.

3. Place a new copper circuit on the poles of the ISR between Tehran and Shahi.

4. Construct a new steel pole line from Gurgan to the point of closest proximity to the railroad right-of-way, about 40 kilometers from Gurgan toward Shahi.

5. Place a new copper circuit on the poles of the ISR from Shahi to the junction with the new steel pole line into Gurgan referred to in 4 above and over this new pole line into Gurgan.

6. Install the 3-channel carrier system with one terminal in Tehran and the other in Shahi and place it in operation over the new copper wire.

7. Install the single-channel speech system with two terminals in Shahi and one each in Gurgan and Babulsar. Install the speech plus duplex telegraph systems with two terminals in Shahi and one each in Gurgan and Babulsar. Place all of these systems in operation over the new copper circuits between the points mentioned.

8. Remove all existing parallel wood pole line and wires of the PT&T and the Telephone Company. The wood poles and iron wires should be used in the reconstruction of new branch and subsidiary lines. The copper wire removed from the existing wood poles of the PT&T between Shahi and Gurgan should be used in the construction of copper circuits on projected new major routes.

No. 15—KARMANSHAH—SANANDAJ

The plans of the PT&T propose the construction of a new steel pole line and one copper circuit between Hamadan and Sanandaj. However, it is considered preferable to construct the new pole line and copper wire from Kermanshah to Sanandaj. The reasons for the proposed change in plans are that the route is shorter, the terrain easier for new construction and the road from Hamadan to Sanandaj is closed for long periods during the winter months. The route from Kermanshah is therefore more likely to be open for plant maintenance.

This project provides for the construction of a new steel pole line and one copper circuit from Kermanshah to Sanandaj. The poles should be salvaged steel rails to be supplied by the ISR. The construction work should be carried out during the sixth year of the Plan. The existing wood poles and iron wire of the Telephone Company on this route should be removed and salvaged for re-use in the construction of new branch and subsidiary lines.

No. 16—AHWAZ—BUSHIRE

This project provides for the placing of one new copper circuit on the existing steel pole line of the PT&T between Ahwaz and Bushire, also the installation and operation of a single-channel speech plus duplex carrier telegraph system over the new copper wire circuit. The work should be carried out during the fifth year of the plan. Consideration should be given to the transposing of the present two large-gauge iron wires to form a metallic telephone circuit for use between adjacent intermediate points located along the route. This work should be undertaken after the initiation of service over the new copper wire and carrier system.

No. 17—BANDAR ABBASS—JASK

There is no existing line of the PT&T between these cities, and the existing wood pole line and iron wire of the Telephone Company extends only a short distance from Bandar Abbass toward Jask. It is proposed under this project to construct a new steel pole line and one copper circuit from Bandar Abbass to Jask, using salvaged steel rails to be supplied by the ISR.

This work should be carried out during the last year of the Plan. A single-channel speech carrier system and a single-channel telegraph carrier system should be placed in operation over the new copper circuit with the terminals located in Bandar Abbass and Jask. The wood pole line and iron wire of the Telephone Company should be removed after the transfer of the present service to the completed copper wire and carrier facilities.

No. 18—KERMAN—BANDAR ABBASS

There is a pole line of the PT&T from Kerman to Bandar Abbass which carries two large-gauge iron wires. This line is of steel pole construction starting from Kerman and for approximately one-half the distance to Bandar Abbass, the remaining section of the line being of wood pole construction. It is proposed under this project to construct a new steel pole line in replacement of the existing wood pole line section. It is also proposed to place a new copper circuit on the steel pole line the entire distance from Kerman to Bandar Abbass.

The construction and installation work should be executed during the sixth year of the Plan. A single-channel telegraph carrier circuit should be placed in operation over the new copper circuit with one terminal in Kerman and the other in Bandar Abbass. There are no parallel pole lines in this section. After the initiation of service over the new copper wire and carrier system, the present two iron wires should be transposed for use as a metallic telephone circuit between adjacent intermediate points along the pole line route. For use with these circuits, a voice frequency cord circuit repeater is proposed at Kerman and also at Bandar Abbass. These repeaters should be used for switched connections between contiguous sections of the copper circuit and also the metallic iron wire circuits, where transmission characteristics permit.

No. 19—SHAHRUD—GURGAN

There is an existing wood pole line of the PT&T carrying one iron wire and located parallel to the main highway between Shahrud and Gurgan. There is a second wood pole line of the PT&T which is located along a more direct route but which traverses very rugged terrain and is difficult to maintain at all times and particularly during the winter months. The Telephone Company also maintains a wood pole line carrying iron wire, but this pole line does not parallel the main highway route.

It is proposed to construct a steel pole line along the main highway from Shahrud to Gurgan via Findarisk. It is also proposed to place single-channel speech carrier and single-channel speech plus duplex telegraph equipment in operation over the new copper circuit.

The work should be executed during the fourth year of the Plan. When this project is completed, the new facilities will provide a copper circuit route from Shahrud to Tehran

via Gurgan and Shahi. This route can be used for the alternative carrier system route between Tehran and Shahrud to Meshed when the normal direct route is inoperative. The work should be carried out in the following order:

1. Purchase the copper wire, carrier-type glass insulators and associated appliances in the latter part of the third year of the Plan. This will enable initiation of actual construction at the beginning of the fourth year of the Plan. Purchase at the same time a single-channel speech carrier system with two terminals. Purchase at the same time a single-channel speech plus duplex carrier telegraph system with two terminals.

2. Construct the new steel pole line along the main highway between Shahrud and Gurgan, using salvaged steel rails to be supplied by the ISR.

3. Place a new copper circuit on the new steel pole line.

4. Install the speech carrier system and the telegraph carrier system with one terminal of each system in Gurgan and the other terminal at Findarisk. Place these carrier circuits in operation over the new copper circuit.

5. Remove and salvage all the wood poles and iron wire of the PT&T and the Telephone Company that can be so treated. This point is made because some detailed study should be devoted to the best arrangement of the circuit layout in this area. In this connection, the PT&T pole line and iron wire which follows the direct route between Shahrud and Gurgan should be retained and rehabilitated between Shahrud and Tash but abandoned between that point and Gurgan.

No. 20—MESHED—GHUCHAN—BUJNURD

There are in existence the following facilities between Meshed and Bujnurd:

1. A wood pole line of the PT&T which carries one iron wire.

2. A wood pole line of the Telephone Company which carries two iron wires from Meshed to beyond Ghuchan and one iron wire from that point to Bujnurd.

It is proposed to construct a steel pole line from Meshed to Bujnurd using salvaged steel rails to be supplied by the ISR. A new copper wire circuit should be placed on the new steel pole line. A single-channel speech carrier system and a single-channel speech plus duplex telegraph carrier system should be placed in operation over the new copper circuit. The construction and installation work should be executed during the fifth year of the Plan.

The copper wire, carrier-type glass insulators and associated appliances should be purchased in the latter part of the fourth year of the Plan in order to permit initiation of the project early in the fifth year. The carrier system with two terminals of each type should be purchased at the same time and placed in operation upon completion of the new copper circuit.

The parallel wood pole lines and iron wire of the PT&T and the Telephone Co. should be removed and salvaged for re-use in the construction of new branch and subsidiary lines.

No. 21—HAMADAN—KERMANSHAH—GHASRE-SHIRIN

There are the following existing pole lines between Hamadan, Kermanshah and Ghasre-Shirin:

1. A steel pole line of the PT&T which carries four copper wires. One of these copper circuits is used for the operation of a 3-channel speech carrier system in service between Tehran and Bagdad, Ghasre-Shirin being an intermediate repeater point for this carrier system.
2. A wood pole line of the PT&T which carries four large-gauge iron wires between Hamadan and Kermanshah and two similar wires between Kermanshah and Ghasre-Shirin.
3. A wood pole line of the Telephone Company which carries one iron wire.

This project provides for the elimination of these duplicate pole lines along this important route by the consolidation of all services on the present copper wire and by placing one additional single-channel speech and one multi-channel telegraph system in operation over the present copper circuits. Four terminals should be provided, one to be located in Hamadan, two terminals in Kermanshah and one terminal in Ghasre-Shirin. This work is proposed for execution during the last year of the Plan.

After transfer of the services from the wood pole line and iron wire to the steel pole lines and copper wire and new carrier systems, the wood pole lines should be removed. The wood poles and iron wire should be salvaged for use in the construction of new branch and subsidiary lines.

No. 22—HAMADAN—MALAYER—ARAK

MALAYER—BURUJIRD—DORUD JUNCTION

DORUD JUNCTION—KHORRAM-ABAD—ANDIMISHK

This project is designed to eliminate duplicate parallel wood pole lines and iron wires of the PT&T and the Telephone Company and to provide additional high quality circuits betwen Tehran and Abadan (or alternatively Ahwaz) by the placing of a combined 3-channel speech and 6-channel telegraph carrier system in operation over existing copper circuits. The construction and installation work is proposed for execution during the fifth and sixth years of the Plan. The removal and salvage of vacated wood poles and iron wire should be carried out during the last year of the Plan.

The following pole lines are in use at the present time in various sections listed in the title of the project:

Hamadan—Malayer

1. A wood pole line of the PT&T carrying four copper wires.
2. A wood pole line of the Telephone Company carrying one iron wire.

Malayer—Arak

1. A wood pole line of the PT&T carrying two copper wires.
2. A wood pole line of the PT&T carrying one iron wire.
3. A wood pole line of the Telephone Company carrying one iron wire.

Malayer—Burujird

1. A wood pole line of the PT&T carrying four copper wires.
2. A wood pole line of the Telephone Company carrying one iron wire.

Burujird—Dorud Jct.

1. A wood pole line of the PT&T carrying six copper wires.
2. A wood pole line of the Telephone Company carrying one copper wire.

Dorud Jct.—Khorram-abad

1. A steel pole line of the PT&T carrying six copper wires.
2. A wood pole line of the Telephone Company carrying one iron wire.

Khorram-abad—Andimishk

1. A steel pole line of the PT&T carrying six copper wires.
2. A wood pole line of the PT&T carrying one iron wire.
3. A wood pole line of the Telephone Company carrying one iron wire.

NOTE: This route is an alternate route to the copper wires of the PT&T which are carried on the poles of the ISR along the railroad right-of-way from Tehran to Andimishk.

The work proposed under this project should be carried out in the following manner:

1. Salvaged steel rails for the construction of new pole lines should be obtained from the ISR in the latter part of the fourth year of the Plan in order to initiate construction work in the beginning of the fifth year of the Plan.
2. Purchase four terminals of combined 3-channel speech and 6-channel telegraph carrier equipment. One terminal should be installed in Tehran, two terminals in Hamadan and one terminal in Abadan (or Ahwaz). Two carrier frequency repeaters should be purchased at the same time for installation at intermediate points in the carrier system.
3. Construct the new steel pole lines in the sections Hamadan-Malayer, Malayer-Arak, Malayer-Burujird-Dorud Junction.
4. Transfer the present copper wires from the present wood pole line of the PT&T to the new steel pole lines.
5. Install and place in operation the carrier system over the present copper wires.
6. Remove all duplicate wood pole lines and iron wires and the vacated wood poles which previously carried copper wires. Salvage the wood poles and iron wire for re-use in the construction of new branch and subsidiary lines.

NOTE: The 3-channel speech and 6-channel telegraph carrier system proposed under this project will be the second multi-channel speech carrier system in operation between Tehran and Ahwaz.

These two systems should not be operated over the same route between Tehran and Andimishk; one system should be operated over the route indicated above and the other system operated over the wires on the pole line of the ISR.

Detailed study should be given to the circuit layout between the cities of Hamadan, Malayer, Arak, Burujird and Khorram-abad to determine the best local circuit layout for the interconnection of these cities. It should be possible to meet all requirements by the use of low-cost speech and telegraph carrier systems.

No. 23—AUTOMATIC EXCHANGE PLANT

This project proposes the establishment of 23,400 lines of automatic exchange plant. It is recommended that this construction be undertaken by the Telephone Company with funds provided from the Seven Year Plan budget.

No. 24—BRANCH AND SUBSIDIARY LINE CONSTRUCTION

As developed in the preceding discussion it is proposed to re-use salvaged wood poles and iron wire in the construction of new branch and subsidiary lines. This plan will enable the low-cost extension of good quality wire facilities to communities not yet connected to the general telephone and telegraph network. The general bases for such a program are presented hereunder:

1. In virtually every section of the country there is the need to provide communications to communities not yet connected to the general network of the country and to rehabilitate existing lines which are inadequate for reliable service.

   The situation should be subjected to careful study for the determination of the locations at which salvaged poles, iron wire and associated appliances should be stocked. These locations should be chosen with the view of using these recovered materials to the maximum extent possible in the immediate area in order to avoid excessive transportation and handling costs.

2. In the rehabilitation of existing pole and wire lines all circuits should be metallic, that is two-wire circuits. In the construction of new pole and wire lines the same practice should be followed. These circuits would be used for long distance telephone circuits.

   This arrangement will make it possible to connect these communities with the general network of the country for long distance telephone traffic which is not possible with the single grounded iron wire circuits at present in use.

3. The operation of telegraph service to these communities would be by means of "Telefonograms" to the greatest extent possible. Where direct telegraph operation is justified the metallic telephone circuit could be simplexed for telegraph use.

4. Careful planning must be used in such a program to insure that the construction of the metallic circuit starts from main centers and spreads outward from these centers. Otherwise, good metallic circuits would meet a bottleneck through grounded wire circuits before reaching a main center and the advantages of the metallic circuits would not be realized.

No. 25—TEST EQUIPMENT AT MAJOR LONG DISTANCE CENTERS

The proper operation and maintenance of the modern long distance telephone and telegraph facilities must be assured by the use of adequate testing facilities at the major long distance centers where carrier system terminals and repeaters are located and where

pole line routes converge into logical points for the handling of switched traffic. This project makes provision for the minimum amount of testing equipment to be located at the important control centers of the long distance network. These test center locations are indicated in Exhibit J-2.

No. 26—MOTOR VEHICLES FOR PLANT CONSTRUCTION, OPERATION AND MAINTENANCE

Construction

Properly-equipped motor vehicles should be provided for the proposed plant construction program. This requirement applies to both the long distance telephone and telegraph plant and to the local telephone plant.

It is proposed to provide ten construction-type trucks of 1½-ton average capacity and equipped with winches, demountable derricks and other line construction tools. The motor-vehicle equipment is essential to the rapid, economical and orderly execution of the large program of construction.

It is desirable to avoid excess travel and the consequent increased costs in the use of the equipment, and for this reason the country should be divided into logical areas and the construction motor vehicle equipment stationed at centers from which all construction projects scheduled for the area can be reached with the minimum amount of travel and time. A suggested plan for the distribution of this motor-vehicle equipment is shown in Exhibit J-3.

Light motor vehicles equipped with special type tool bodies or "pickup" bodies should also be provided for the use of cable splicing crews and small-sized construction crews. In addition, the supervisors responsible for the orderly execution of the plant construction program should be provided with light passenger cars in order that they may cover their respective areas frequently and rapidly. These motor vehicles are included in the group proposed under Operation and Maintenance.

Operation and Maintenance

The new plant which it is proposed to construct under the Seven Year Plan will be of modern design and good quality. The rendering of reliable service to the public requires that this plant be operated and maintained to much higher service standards than are known in Iran today.

To this end, it is essential that repairmen assigned to the maintenance of the long distance telephone and telegraph plant and the local telephone plants in the principal cities be supplied with properly-equipped motor vehicles. Such equipment will enable the prompt clearing of troubles and installation of new services.

It is proposed under this project to provide a minimum number of light motor vehicles equipped with special type tool bodies adapted to the several service needs. This provision will include the light cars for supervisory purposes which have been mentioned above and the requirement for which also applies to the operation and maintenance of the plant.

A total of 44 light motor vehicles is provided under this project for the purposes outlined, and the suggested distribution of these motor vehicles among the principal cities of the country is indicated in Exhibit J-3.

No. 27—TOOLS AND EQUIPMENT

The program of construction proposed under the Seven Year Plan and the associated operation and maintenance of the plant require the adequate provision of tools and equipment. This project makes provision for the minimum quantity of such tools and equipment. These tools can be classified into the commonly-termed "Body Tools" such as, pliers, connectors, portable test sets, soldering kits, cable splicers kits, body belts, climbers and wire grips and the "Common Group" tools such as, jacks, pumps, pike poles, peavies, wire eels, and cable grips. These tools should be stocked at central points and issued to individual workman and group foremen as required but on some proper form of disbursement ticket which makes the individuals responsible for their proper care and return.

No. 28—SCHOOLS FOR THE TRAINING OF OPERATING AND MAINTENANCE STAFFS

The successful execution of the program proposed under the Seven Year Plan can be assured only by the early establishment of schools designed primarily for the training of the personnel in the vocational duties pertaining to each department. These schools should be placed under the direction of qualified instructors who have been long experienced in the various phases of departmental operations and maintenance of the plant. It is considered that foreign experts should be brought into the school training program at the earliest possible date in order to secure the advantage of their peculiar qualifications and experience in the very beginning of the program.

These training schools should be established at several well-located centers in order to secure the maximum recruitment from the immediate areas where the men should normally be stationed permanently in order to distribute the work and therefore make the maximum headway in the training program.

The various vocational phases of training to be undertaken should embrace:

Telephone switchboard operation

Teleprinter and other modern methods of telegraph transmission

Radio technicians in both the installation and operation—maintenance of the equipment and service

Test-table operators for both long distance and local plant maintenance

Telephone instrument installers and repairmen

Outside plant construction linemen

Repairmen for the maintenance of long distance lines

Cable splicers

Installers of automatic telephone equipment, both of the central office and private branch exchange type

Maintenance men for the automatic and manual central office equipment

The proper care of the buildings and property.

This project provides a total amount of funds to be used in the establishment and operation of training schools of the type described above. A study should be initiated at an early date for the determination of the proper centers for their location and the close definition of the range of subjects to be included in the training program.

No. 29—RECONDITIONING EXISTING RADIO TRANSMITTERS

As soon as possible during the first year recondition and put in operation the 30-kilowatt Telefunken and 7½-kilowatt RCA short-wave telegraph and telephone transmitter at Radio Tehran.

No. 30—INTERNATIONAL RADIO TELEPHONE FACILITIES

This project proposes the establishment of a 20-kilowatt single side band 3-voice channel, telephone transmitter, associated directional antennas, buildings and accessories at a new site near Tehran. This new facility will share the same building and utilize diesel-electric generating equipment with the new broadcast stations.

It is recommended that during the second year land be purchased for the site, building construction begun and orders placed for the diesel-electric generating equipment. Construction of the building should be completed early in the third year and the power plant should be installed and operating. Early in the third year orders should be placed for the transmitter receivers and their respective associated antennas and other accessories. Installation should be completed and operation commenced in the fourth year.

No. 31—INTERNATIONAL RADIO TELEGRAPH RECEIVERS

This project proposes the establishment of additional international radio, telegraph and telephone receiving facilities at Tehran. It is recommended that three new diversity receivers and associated directional antennas be installed in Tehran. It is estimated that this equipment will be needed by the fourth year and should be procured and installed during the third year.

No. 32—DOMESTIC RADIO TELEPHONE AND TELEGRAPH

This project proposes the establishment of 1-kilowatt radio telephone and telegraph transmitters with receivers, antennas and other accessories in the following cities: Ahwaz, Tabriz, Shiraz, Kerman, Zahidan, Meshed, Yezd and Sanandaj; and 300-500-watt radio telephone and telegraph transmitters with receivers, antennas and other accessories in Isfahan, Hamadan, Resht and Gurgan.

These facilities are to share the land, buildings and diesel-electric generating plants with broadcast stations described under Project No. 38.

We recommend that during the second and third years land be purchased, building construction begun and orders be placed for the transmitters, receivers, antennas, diesel-electric generating equipment and all accessories. Construction and installation should be completed and operation begun in the third and fourth years.

No. 33—MARINE RADIO

This project proposes the establishment of 300-500-watt radio marine transmitters, receivers and associated equipment for the ports of Khorram-shahr, Bandar Shahpur, Bushire and Bandar Shah.

We recommend that orders be placed for the necessary equipment and materials for Khorram-shahr and Bandar Shahpur early in the third year and for Bushire and Bandar Shah early in the fourth year. Installation should be completed and operation begun during the same years. No buildings are proposed, it being assumed that the ports facilities will furnish the small space requirements.

No. 34—DOMESTIC RADIO TELEPHONE AND TELEGRAPH

This project proposes the establishment of seven 1-kilowatt radio telephone and telegraph transmitters with receivers, antennas and other accessories in Tehran for communication with those of Project No. 32. We recommend that these transmitters be installed in the present transmitter building and the receivers in the present receiver station; consequently no new buildings or land are needed. It is also recommended that the equipment and material procurement and installation proceed concurrently with Project No. 32.

No. 35—NEW TELEGRAPH CENTRAL OFFICE

This proposes the establishment of a new telegraph operating central headquarters in Tehran. We recommend that land be purchased and building construction capable of providing the foreseeable space requirements for a period of at least 15 years be started during the second year.

Orders should be placed during the second and third years for the necessary line terminal equipment and teleprinter and tape distribution equipment and accessories for initial requirements. Construction and installation should be initiated during the second year and completed and put in operation during the third and fourth years. Additional telegraph equipment should be added as the needs develop.

No. 36—RECONDITIONING EXISTING RADIO TRANSMITTER

As soon as possible during the first year, recondition and put in operating condition the 7½-kilowatt RCA short wave transmitter in Tabriz.

No. 37—SHORT- AND MEDIUM-WAVE BROADCAST TRANSMITTERS

This project proposes the establishment of one 50-kilowatt standard broadcast transmitter and one 20-kilowatt short-wave broadcast transmitter with their respective associated antennas and other accessories in Tehran. It is proposed that these facilities occupy the same property buildings and share the diesel-electric generating equipment of the proposed radio telephone transmitter described under Project No. 30.

It is recommended that orders for the transmitter and associated equipment and material be placed during the second year. Installation should be completed and the facilities put in operation during the third and fourth years.

No. 38—REGIONAL AND LOCAL BROADCAST TRANSMITTERS

This project proposes the establishment of 1-kilowatt standard broadcast transmitter, antennas and associated materials and accessories in the following cities: Ahwaz, Tabriz, Shiraz, Kerman, Zahidan, Meshed, Yezd, Sanandaj, Isfahan, Hamadan, Resht and Gurgan. These facilities are to share the land, buildings and diesel-electric generating plant described under Project No. 32.

It is recommended that orders be placed for the transmitters, antennas and associated material and accessories during the second year. Construction and installation should be completed and operation begun in the third year.

No 39—LOCAL BROADCAST TRANSMITTERS

This project proposes the establishment of 100-watt standard broadcast transmitters, antennas and associated materials and accessories in Rezaiyeh, Kermanshah and Babul. Use is proposed of the three 100-watt Telefunken broadcast transmitters now on hand.

It is recommended that land be purchased and building construction be undertaken in the second year. Orders should be placed for three power-supply rectifiers for these transmitters in the second year, together with the necessary antennas and other associated material and accessories. Construction and installation should completed and operation begun during the third year.

No. 40—NEW BROADCAST STUDIO FACILITIES

This project proposes the establishment of new broadcast studio facilities for Tehran. It is recommended that land be purchased and building construction begun during the second year. In the event an existing building is found suitable the necessary alterations and construction of studios and control rooms should be started during the second year.

Orders should be placed during the second year for the necessary control desks, switching equipment, portable remote pickup equipment and associated materials and accessories. The construction and installation should be completed and operation should begin during the third year.

No. 41—TELEGRAPH EQUIPMENT

It is recommended that orders be placed for four complete Boehme high-speed transmitting and receiving sets early in the second year. These should be received and put in operation with the rehabilitated radio telegraph equipment during the same year.

No. 42—TELEPRINTERS

It is recommended that teleprinter and associated tape perforaters and distributing equipment be procured to modernize the telegraph services.

No. 43—PUBLIC ADDRESS SYSTEMS

This project proposes public address systems equipment for use in Tehran and other cities and for portable and mobile units for special occasions. It is recommended that procurement of this equipment be deferred until the third or fourth years when the communications and broadcasting facilities will have been extended and improved. The type, quantity and allocation of this equipment cannot be precisely determined at this time. The sum allocated for this project is believed adequate for the needs under the Plan.

No. 44—SCHOOL LABORATORY AND LIBRARY

This project proposes the establishment of fundamental instruction and education in radio and telegraph and telephone communication. We recommend that in collaboration with the educational institutions in Tehran a laboratory be equipped and instruction arranged. For this purpose a sum which is believed adequate has been allocated to cover the first five years of the Plan, by which time it is expected the need for this special training effort will have been fulfilled and further training can be supplied out of operating revenues or from the normal channels of education.

INDUSTRY AND MINING

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INDUSTRY AND MINING

INTRODUCTION

The purpose of our study of the industries and mines of Iran was four-fold:

1. To gain a direct knowledge of production and productive facilities. This involved study of such statistical and financial data as were available with respect to production, consumption, importation, and export of various commodities; of the methods and ability of management; and of the condition, capacity and efficiency of the principal productive plants and mines.
2. To determine what can be done to raise the levels of production and to improve the operating efficiency of existing industrial plants and mines, including those owned both by the Government and by private interests.
3. To determine which of the existing industries should be expanded, and what new products should be manufactured.
4. To estimate the expenditures needed to carry out our recommendations as to the rehabilitation and expansion of industries, and to obtain the technical assistance of foreign specialists which we deem to be essential to the success of the Plan.

Our study included the following industries:

Cotton textiles
Silk
Wool
Jute
Carpets and rugs
Cement
Other construction materials
Army munitions plants
Sugar
Dried fruit packing
Grain elevators
Chemicals
Mining
Iron and steel

Because of the major role played by the Government in industry and of the responsibility of the Industrial and Mining Bank in the management of Government-owned plants, the operations of the Bank were studied also.

Our work included visits by members of our organization to all the principal industrial and mining districts of Iran including Tehran, Abadan, Ahwaz, Isfahan, Kashan, Kazvin, Kerman, Meshed, Shiraz, Tabriz, and all the cities on the Caspian Sea from Resht to Behshahr.

In each district, we inspected all the large plants and many of the smaller plants, and collected information as to condition, capacity, production, sales, earnings, and other pertinent data. Operations of existing mines were examined, and indicated mineral deposits were studied.

We interviewed the managing officials at plants and mines, and conferences were held with public officials and leaders in the areas visited to discuss the problems of the

community and to receive their suggestions for betterment of conditions. We held many discussions with Government officials, who furnished us with statistical data and other information and, in general, were most helpful.

INDUSTRIAL AND MINING BANK

The Industrial and Mining Bank was founded in Farvardin 1325 (April 1946) as a joint stock company to acquire and operate certain industrial and mining properties which formerly were operated by the Ministries of Finance, Agriculture, and National Economy. All the stock of the Bank is owned by these ministries. The Bank owns and operates all the important Government factories except those of the Tobacco Monopoly, grain elevators (silos) and flour mills, which are subsidiary to the Ministry of Finance, and the Army munitions plants.

The Bank is authorized to assist in financing industry and mining by extending short-term loans, purchasing shares of privately-owned companies, establishing companies owned jointly by the Government and private interests, and carrying on general banking functions. The Bank also is empowered to provide technical guidance to private industry for compensation. The banking function has not been developed to any significant degree, apparently due to lack of funds, and there seems to have been no demand by private industry for technical guidance from the Bank's personnel.

The Bank owns 100 plants, many of them small, located principally in the north near the Caspian Sea and in the environs of Tehran. The properties include:

- 8 Beet sugar factories (one of which is not in operation)
- 3 Cotton textile plants; two in Mazarandaran and one in Azarbaijan
- 1 Cotton textile plant near Tehran which has been under construction for about 8 years
- 25 Cotton gins in Mazandaran
- 1 Silk weaving mill in Mazandaran
- 16 Cocoon drying stations
- 5 Silkworm breeding plants
- 1 Jute mill in Mazandaran
- 1 Cement mill near Tehran
- 5 Plants in Terhan area, producing soap and glycerine, sodium carbonate, hydrochloric acid, low temperature refractory bricks and vegetable oils
- 1 Electrolytic copper refinery near Tehran
- 1 Creosoting plant in Mazandaran
- 5 Tea processing plants in Mazandaran
- 9 Rice cleaning plants in Mazandaran
- 1 Conserve cannery in Mazandaran
- 1 Sardine cannery on the Persian Gulf
- 9 Mines of iron, copper, lead, sulphur, manganese, soda, salt, and red oxide of iron
- 6 Coal mine properties
- 1 Factory at Vanek (No. 5) manufacturing a variety of small products.

The Bank owns real estate at Karaj on which, before the war, it was planned to locate a steel plant with a capacity of 300 tons per day. The plant was not completed, and the property consists only of concrete foundations for machinery and equipment

and a townsite with an administration building and a number of residences. The Bank owns also a building at Hasht-Gerd designed to house a caustic soda plant which was not completed.

When the Bank was formed there were no records as to the cost or appraised value of the assets acquired. Subsequently a special department of the Bank was formed to establish their replacement value before depreciation as of the date of the founding of the Bank. The total value so established was Rls. 2,370,000,000, made up approximately as follows:

Textile mills	35 per cent
Sugar factories	31 per cent
Factories in environs of Tehran	15 per cent
Mines	7 per cent
Miscellaneous plants	12 per cent

The operations of the plants are controlled by the central organization in Tehran and are, to a great extent, in the hands of the Director General and five assistants appointed by him. A Board of Directors of five is appointed by the Council of Ministers to act, on a full-time basis, with the Director General. The Director General is responsible to the Supreme Council, which consists of seven members appointed by the Council of Ministers, three of whom represent the stockholding Ministries. The Director General has final authority on matters regarding personnel and routine operations, but must secure the approval of the Supreme Council on budget and other matters of broad policy. We were advised that the Supreme Council seldom meets and that its functions are largely nominal. Government inspectors are appointed by and report to the Council of Ministers to audit and confirm the budget and financial statements of the Bank.

The organization of the Bank consists of fourteen service departments and seven operating departments, all of which report direct to the Director General. The service departments comprise the Commercial Department, in charge of purchasing, sales, and transport; Technical Department, which prepares specifications and designs, and has charge of construction; Stores Department, which maintains ten warehouses in scattered locations in Tehran; Personnel Department, which keeps records of the 5,000 supervisory and technical employees of the Bank, about 1,400 of whom are located in Tehran and the remainder at the plants; Accounts Department, in charge of accounts, receipts, disbursements, and banking operations; and nine other departments, in charge of special studies, inspection, propaganda and publicity, social welfare, labor relations, service and maintenance, statistics and research, supplies, and valuation.

The seven operating departments consist of the Northern Factories Department, which supervises the operations of the cotton, silk and jute mills, and the creosoting plant in Mazandaran, and the cotton knitting mill in Tabriz; the Central Factories Department, operating the cement mill, soap, refractory brick, and chemical factories located in the environs of Tehran, and the Bandar Abbass sardine cannery; the Sugar Factories Department, supervising the eight beet sugar plants; Silkworm Administration; Agricultural Factories Department, operating tea and rice processing plants and cotton gins; Coal Mines Department, supervising six coal properties; and the Metallurgical and Exploration Department, in charge of copper, iron, sulphur, red oxide, rock salt, and arsenic mines.

The number of employees at headquarters in Tehran and on the supervisory and labor staffs at most factories is not only much greater than would be needed for operation with modern equipment, but is grossly in excess of that actually needed at the plants as presently equipped. This not only results in high costs for salaries and wages, but adversely affects the productivity and morale of workers and makes efficient operation impossible. Apparently, appointments to supervisory staffs are made largely for political purposes and usually with little regard to experience and ability. Managers, and to a lesser extent members of the subordinate staff, are changed frequently.

Control of even detailed functions of the operating factories is centralized in Tehran. The time required to process a transaction through the many departments at Tehran is excessive. For example, if a sugar factory prepares a specification and requisition for a piece of equipment, even if urgently needed, it is first forwarded to the Sugar Factories Department at Tehran which refers it to the Director General for his approval. If approved, it goes to the Commercial Department, which refers it to the Technical Department to review the specifications, then to the Stores Department to ascertain whether it is in stock, then back to the Commercial Department for purchase. When the equipment is received, it is delivered to the Stores Department and arrangements are made by the Commercial Department to transport it to the factory. As a result, frequently six months or more are required to complete an order for a simple piece of equipment which may be needed for the processing of a current sugar-beet crop.

The accounting statements of the Bank for the year 1326 showed a combined net income of about Rls. 133,000,000. The reported profit of sugar factories was Rls. 205,000,000, and that of the Behshahr Textile Mill, Rls. 37,000,000; mines showed a loss of Rls. 27,000,000, and cement a loss of Rls. 10,000,000; some of the remaining factories showed small profits, but the majority showed losses. The profit of the sugar factories was mainly due to the fact that about one-half of the output was sold in the free market at prices substantially higher than those fixed by the Government. In 1327, premium prices were not obtainable, and they are unlikely to occur in the future. Data as to the financial results of the Bank's operations for the year 1327 were not available at the time of our study, but we were advised that a very substantial operating loss probably was incurred.

In our opinion a large number of the demonstrated shortcomings in the operation of the Industrial and Mining Bank can be attributed to Government ownership. Inherently the stimulus towards efficiency which can be created by competition and the desire for individual financial gain is lacking. Therefore, we believe that the long-term policy of the Government should be to rid itself of its various industrial enterprises by transferring them to private ownership. We recognize, of course, that implementation of such a policy will take time and that in many instances it may be necessary to spend considerable sums for rehabilitation of plants in order to attract private capital. Also, it will be necessary to relieve the Government-operated plants of surplus personnel. Privately-owned industry should not be hampered by the necessity of employing more people than can be used profitably, not only because of competitive necessities within Iran, but to enable Iranian industries to meet competition from abroad.

It is our opinion that, to carry out this long-term policy, it is essential that the operations of the Industrial and Mining Bank be completely reorganized by a transfer of the properties to the Plan Organization, by the complete reorganization of the Bank under the supervision of the Plan Organization, or by a combination of these two procedures.

Steps should be taken immediately to simplify the method of operation of the industries. We believe that the various plants should be set apart in divisions in accordance with their activities, such as textiles, sugar, cement, mining, chemicals, and food, and that a capable and experienced man, as Divisional Director, should be put in charge of each. Matters of general policy should be decided by the Director General of the Bank or the executives of the Plan. The Divisional Director should be held responsible for carrying out these policies and for the operations of the properties within his division. All expenditures for capital improvements and major repairs should be authorized by him, subject to budgeted appropriations approved in advance by the executive head. Much of the detail work now done at headquarters in Tehran could thus be decentralized and time and expense saved. Complete financial and statistical reports of each division should be published at least annually.

Plant managers under the direct supervision of the Divisional Director should be appointed by him upon the basis of proven ability and experience. Managers should be paid an adequate salary with incentives for improved performance. Their tenure of office should not depend upon political influence or expediency, but solely upon competency and honesty. As with the Divisional Directors, plant managers should select their subordinate staffs. However, in no event should nepotism be tolerated.

The problem of surplus personnel at all Government-owned plants is difficult. We understand that many of these people are classified as civil servants and that, as such, they must be retained on the payroll and that the continued employment of others is mandatory under existing regulations. Increased production in the plants would serve to relieve matters, especially if multiple shift operation can be instituted at plants now operating only part time. Furthermore, as operation of the Plan gets under way, surplus personnel must be transferred from presently operated Government-owned plants to new projects.

COTTON TEXTILES

Next to essential foodstuffs, cotton piece goods are the most important staple of Iranian life. Lack of adequate statistics makes it very difficult to calculate the annual consumption of cotton piece goods with any degree of certainty. However, the Ministry of National Economy's estimate of between 150,000,000 and 180,000,000 running meters may be taken as generally indicative of the present level of consumption. On this basis, annual per capita consumption is between 8.5 and 10.0 meters.

The volume of consumption varies greatly with fluctuations in price, and prices in turn are highly sensitive to changes in supply. It is probable that, at the high prices prevailing a year ago, consumption may have been little more than at an annual rate of 100,000,000 meters. However, with price declines of from 30 to 50 per cent over the past six months, it is possible that consumption may have risen to an annual rate of 150,000,000 meters or more.

The marked sensitivity of demand to price changes is important to both present and future markets. It indicates the possibility of materially expanded sales volume if lower prices are achieved through increased productive efficiency and lowered unit costs. Present consumption levels, therefore, should not be considered to be fixed and final.

Moreover, it is probable that the potential per capita consumption is in the neighborhood of 30 meters annually, or three times the present rate. Meeting these needs would require an annual supply of more than 500,000,000 meters. These are estimated current

needs, without any allowance for growth in population. Supplying the per capita needs of a people represents a broad objective for the national economy, rather than a completely attainable goal. However, assuming reasonable prices and a general increase in purchasing power, there seems little doubt but that the consumption potentials in Iran are materially greater than present demand. An orderly development of the cotton textile industry, therefore, should provide opportunities for profitable business ventures and be an important contribution to the national well-being.

Current production of cotton piece goods is about 70,000,000 meters, the remainder of the national needs being supplied by imports. More than 55 per cent of current production is by means of hand looms. Approximately 30,000,000 meters of cloth and between 11,000,000 and 12,000,000 kilograms of yarn are produced by 30 textile mills equipped with about 200,000 spindles and 2,236 power looms. An estimated one-half of the yarn is used for hand loom production of piece goods, a large amount is employed for knitted underwear and stockings, and a smaller quantity in the manufacture of blankets and rugs.

The hand loom is a highly inefficient and costly method of producing cotton piece goods. It is estimated that one hand loom operator, working from 12 to 16 hours a day, can produce about seven meters of cloth, 70 centimeters in width, whereas a power loom weaver operating two looms can produce 80 meters of much more uniform cloth in eight hours' running time. The high unit cost of hand loom production places it at a competitive disadvantage, which becomes critical in times of declining prices. Evidence of this is found in the report that 30,000 hand looms are currently idle in the Isfahan-Yezd area. Each of these looms affects the employment of four workers, most of whom are in dire straits today.

There is a substantial geographical concentration in present cotton textile facilities. Nearly three-quarters of the spindles and over four-fifths of the looms are located in Ostans 2 and 10, with the Isfahan-Yezd and Shahi-Behshahr areas each accounting for about 30 per cent of total productive capacity.

The rate of production is considerably below capacity and varies greatly from plant to plant. In 1326, for example, the two weaving mills in Isfahan devoted to weaving cotton cloth produced 7,891,000 meters of cloth, or an average of 26,300 meters for each of their 300 looms. However, the national average rate of production is only about one-half of this rate, despite the fact that these two mills cannot be considered as being efficiently operated. As another comparison, the Government plant at Behshahr in 1326 produced 12,000,000 meters of cloth on 1,200 looms, an average of only 10,000 meters per loom. The Behshahr plant has been running its looms only one shift a day, and its production has been further restricted by occasional power shortages.

The reasons for present low production ratios fall into several broad classifications: the poor condition of most equipment, excessive personnel, the relatively low level of technical and business management, and unsound financial policies which have impaired maintenance and denuded many companies of working capital.

Present plant and equipment is generally in very poor condition and urgently needs rehabilitation. Faced with reduced imports and increased demand during and immediately after the war, cotton textile plants were operated continuously with little time for adequate maintenance. Also, repair parts, needed principally from Germany, Great Britain or Czechoslovakia, either were completely unavailable or could be secured in but limited quantities, a situation which is not yet completely rectified. Foreign

technical advice was not available. These factors, combined with general failure on the part of management to appreciate the importance of high maintenance standards, have resulted in the plants being in very poor condition and in serious need of rehabilitation.

Since the war, exchange regulations have impeded the rehabilitation of textile plants in two ways. Detailed and frequently changing regulations have delayed the processing of import applications for long periods, and fluctuations in applicable exchange rates between the time new equipment has been ordered and final payment made have introduced an element of uncertainty into cost calculations.

The following are among the principal equipment needs. Carding machines require new card clothing which must be kept sharp by scheduled periodic grinding, thus allowing for the production of properly cleaned fibers and of a uniform sliver. Many drawing frames need overhauling and resetting for the length of cotton staple used. Replacement of worn-out rollers and the re-covering of other rollers with the proper quality leather or felt also are necessary. Spindles need to be checked for speed and balancing. Many looms require cleaning, repairs and adjustment. Repair parts will be required to effect much of the needed rehabilitation.

Power plants at the mills are in poor condition, and much repair work is needed. Diesel units should be checked as to fuel feed, a vital spot in efficient performance, and require replacement of broken and worn-out parts. In the Shahi-Behshahr area, several of the steam plants are in great need of rehabilitation of boilers and reblading of turbines.

While practically all cotton mills visited were found to have air-conditioning equipment in their carding, spinning, and weaving departments, practically none of it was in use. Proper control of humidity reduces flying cotton lint to a minimum, conditions the fibers and reduces static electricity, resulting in a more uniform yarn of greater strength and an estimated 80 per cent reduction in breakage; working conditions also are improved. Proper air-conditioning and humidity control is especially important in high, dry altitudes such as are common in Iran. Inasmuch as most repairs and rehabilitation can be made locally, there is no reason why this equipment cannot be put into working order immediately at little cost.

The need for parts for the carding, spinning, weaving, and finishing departments is common to all cotton textile plants, while rehabilitation of boilers and turbines and the provision of additional power frequently is necessary.

We have made tentative estimates of the cost to rehabilitate the two Government-owned cotton mills at Behshahr and Shahi, based on information furnished by employees of the Industrial and Mining Bank, as follows:

	In Thousands of Rials		
	Domestic	Foreign	Total
Estimated Cost of Rehabilitation:			
Behshahr mill	4,110	15,890	20,000
Shahi	4,100	13,900	18,000

It is estimated that the amount of labor currently employed in both Government and privately-owned textile plants is between 20 and 50 per cent more than necessary for efficient operation. The surplus labor was accumuated during and immediately following the war and, up to the present, its discharge has been forbidden by the Ministry of Labor. It is probable that important political considerations have played a significant part in current policies. Excess labor, in addition to increasing costs, has been a deterrent to

good morale and discipline. Two shifts of 10 and 12 hours each are currently in use in practically all privately-owned textile establishments.

We believe that if all installed spindle capacity were put in good operating condition, the necessary reliable power provided, and surplus labor employed more efficiently, yarn production could be increased approximately 50 per cent with a great improvement in its quality. Current power loom production also could be increased substantially by the same means, while the gradual substitution of power looms for hand looms would add greatly to cotton piece goods output at lower unit costs.

The low level of both technical and business management also has contributed to present low production rates. Iran's textile development has been comparatively recent, much of the private expansion having taken place about 1313 to 1315 (1934-1936). The original work of installing and directing the enterprises was in the hands of foreign technicians, principally Germans. The advent of war eliminated these foreign technicians and provided no adequate substitutes. Iranian supervisors had not received enough training to cope with new problems. In dyeing, for example, Iranians today are familiar with German dyes, and are not trained in the use of Swiss or American products.

Prior to the war, management was frequently divided between a foreign technician, who supervised production, and an Iranian, who was in charge of the business operations. The Iranian business manager was not trained in technical matters. This fact, together with the easy profits of the war period and the great speculative opportunities which a chronic shortage of goods engendered, resulted in a gradual deterioration of management. When competition recently became more severe, many managements neither were equipped psychologically nor possessed of the necessary business skill to meet the new challenge.

The ill effects of poor management were materially intensified by unsound financial practices. Some of these practices undoubtedly arose out of lack of knowledge; others from the confusion and temptations of the times. Charges for depreciation, for example, are practically unknown in Iran, and, where applied, are generally inadequate. The maintenance of adequate reserves for depreciation is necessary to provide for the replacement of capital lost through wear and tear and obsolescence. Accounting practices are primitive, especially with respect to costs of manufacture; indeed, there is little appreciation of the importance of accurate accounting and statistical information, and of the contribution which such information can make towards profitable operation.

Most, if not all, of the privately-owned mills find themselves with insufficient capital for expansion and working needs. Practically all of the large earnings of the war and postwar years were distributed in dividends. In some cases, the aggregate of dividends paid have amounted to several times the original investment.

Various means were used to avoid income taxes and to reap additional profits for directors and others in authority. Occasionally dividends were declared in the form of merchandise upon which a low valuation had been placed, the directors and stockholders then selling the goods in the bazaar at higher prices; or one or more directors might buy the output of the plant at a low price and resell it at a speculative profit. Directors tended to vote themselves exorbitant salaries and to show little or no sense of personal responsibility for the sound management of the corporation.

Purchases of raw materials have seldom been scheduled in terms of estimated requirements, frequently have been made at the wrong seasons and sometimes have been

effected speculatively through middlemen working in conjunction with directors of the company.

There seems to be little or no knowledge of modern merchandising methods. No new designs have been introduced for cotton print cloth within the past ten years by either private or Government factories, although approximately 50 per cent of the cotton fabrics sold in Iran are prints.

The Government textile plants suffer from many of the shortcomings of management and unsound business practices prevalent in the private companies. They suffer from the effects of poor administration by the Industrial and Mining Bank. The influence of the Bank and its methods have been discussed elsewhere in this report. Briefly, it may be said that the principal problems created by the Bank's administration arise from overcentralization of authority, too detailed supervision, excessive delays in the procurement of equipment and supplies, poor accounting, and inexpert merchandising and selling methods.

Within the past several years, private enterprise has shown active interest in the expansion of the cotton textile industry, and Government plans also have included the installation of additional facilities. A Government factory, eventually to include 32,000 spindles and 1,400 looms, is under construction at Tehran. It is reported that much of the machinery, which has already been paid for, is in storage in Hamburg and other German cities and that negotiations are under way for its delivery. Until this matter has been clarified it will be impossible to arrive at a final estimate of the cost of getting this mill into operation.

Within the past two years, the Ministry of National Economy has authorized the sale to private investors of foreign exchange for the importation of 258,880 spindles and 7,315 looms. In addition, applications have been made for exchange for the importation of 200,864 spindles and 3,619 looms, and are currently under consideration.

It is possible that, in view of the decline of profits from the excessively high levels of the war and immediate postwar period, some of the planned expansion may not be carried out, but present firm commitments would increase the nation's plant capacity more than two-fold. Under favorable conditions, total spindles in operation by the end of 1330 may be about 600,000.

The following table shows the geographic distribution of present and planned spindle and loom capacity:

Ostan	Percentage of Total Population	Present Facilities		Present Plus Contemplated Facilities	
		Percentage of Spindles	Percentage of Looms	Percentage of Spindles	Percentage of Looms
1	9.6	1.6	4.5	2.0	0.8
2	18.9	43.8	66.3	53.5	63.0
3 & 4	15.8	4.0	1.5	2.9	0.2
5	10.9	—	—	2.4	4.5
6	9.7	4.4	—	1.9	0.1
7	7.4	7.3	6.7	8.7	10.8
8	5.3	5.0	—	5.3	6.8
9	13.7	5.1	6.7	1.3	1.1
10	8.7	28.8	14.3	22.0	12.7
Total	100.0	100.0	100.0	100.0	100.0

It will be noted that, under present plans, Ostans 2 and 10 would continue to be by far the most important manufacturing centers. Tehran alone would have 173,000 spindles or 30 times the number now installed there. Such concentration in Tehran would add to labor and housing problems there, and would increase further its undesirable dominance in the Iranian economy.

We believe that the Plan Organization should promptly institute a study of the proposed expansion of the cotton textile industry throughout much of Iran. Major market areas are widely scattered and transportation costs are extremely high. The most economical organization of the cotton textile industry, therefore, would be effected by a balanced regional development of both cotton production and textile manufacturing.

Many of the proposed new mills are planned to have from 3,000 to 6,000 spindles. Experience has shown that much greater efficiency can be secured from units with a capacity of about 20,000 spindles, supplemented by sufficient looms, auxiliary equipment, and dyeing and finishing machinery to convert most of the yarn produced into finished fabrics at a low unit cost. The Plan Organization should endeavor to effect consolidations of the proposed small units with a view to the establishment of a smaller number of mills of economical size. An important saving in both capital and operating costs could be effected thereby.

The estimated power requirements for the additional textile capacity will be about 30,000 kilowatts. In general, power will be provided by small diesel units installed as part of the mill. However, the need for central power installations in some of the larger centers to meet industrial, residential, and deep-well pumping requirements is apparent, and new sources of power should be developed as recommended elsewhere in this report.

The marked decline in cotton piece goods prices in recent months has raised the question of the degree to which present expansion plans may actually be carried out. Piece goods are now being sold in Iran at the lowest price in many years. The monopoly tax on the value of imported cotton textiles has been reduced, and the value of the rial in terms of dollar exchange is now much greater than a year ago. As a result, wholesale prices of imported and domestic piece goods have declined between 30 and 50 per cent during the past six months, domestic prices declining only because of the pressure from imported goods. Although the import quota for 1328 has been reduced, the decline in world piece goods prices has been such that the volume of goods which can be imported may not be reduced materially.

In spite of the increased competition from imports, factory inventories do not seem to be excessive and properly priced domestic merchandise seems to be selling well. Stocks in the Isfahan-Yezd area are reported to represent from two to three months' production, somewhat larger than usual but not excessive. There has been some complaint that factories are unable to operate profitably at current price levels, but there also is evidence that some companies are doing so. With efficient use of existing capacity, the majority of Iranian textile mills should be able to meet foreign competition successfully and conduct their operations profitably, as transportation, freight, insurance and warehouse charges, plus various Iranian taxes and duties, increase the cost of imported cloth by about 60 per cent.

It is impossible, in the economic survey of an industry, to separate considerations of raw material supplies and preliminary processing entirely from those of final manufacture. Therefore, attention must be paid briefly to the problem of raw cotton supplies, ginning capacity, and the effective use of by-products.

Approximately 50,000 metric tons of ginned cotton will be required if the planned expansion of textile facilities is carried through. This is nearly three times the 1326 production of 17,500 tons and one-fifth greater than the 1318 (1939) peak production of 42,000 tons. Consequently, between 20,000 and 30,000 tons of raw cotton may have to be imported during the period when cotton production is being increased to meet the needs of the expanded textile industry.

While cotton is grown in most sections of the country, Khorassan and Mazandaran furnished about 50 per cent of the 1326 supply of ginned cotton. However, the elimination of insect pests in Ostans 5 and 6, a project recommended in the agricultural section of this report, and expanded production in Ostan 8 should make cotton available to practically all major textile areas.

Ginning capacity is sufficient for the immediate future in most of the ostans, but may have to be increased by as much as 50 per cent when more cotton is grown. Since the dissolution of the cotton monopoly there has been inadequate grading as to staple length and quality. This makes it impossible for spinning mills to obtain a uniform quality of raw material. An effective grading and standardization program for cotton staples, therefore, is most essential. Cotton ginning lends itself favorably to private ownership, but the construction of new facilities may require the loan of Plan funds up to 50 per cent of the cost. The estimated cost of additional cotton gins in the later years of the Plan is Rls. 30,000,000, of which 20,000,000 would be needed for foreign exchange.

While there are some oil extraction plants in Iran, there is evidence that the by-products of cotton seeds are not being utilized to best advantage. Cottonseed oil contains important food values in which the Iranian diet is largely deficient. Moreover, the heavier and cloudy residues provide excellent soap stock, while the meal and filter cakes are good food for cattle and livestock. Small extraction mills, with hydraulic or continuous screw presses and auxiliary equipment for cracking and cooking the seeds, can be installed at a relatively low investment and can be operated at low cost. The installation of such plants in the principal cotton-growing districts is most desirable.

CONCLUSIONS AND RECOMMENDATIONS

The potential market for domestically-produced cotton piece goods is large and, with increased efficiency, it should be possible for Iranian manufacturers to serve the national market satisfactorily and profitably. The rehabilitation of existing plants should enable them to compete successfully with imported goods, and the orderly expansion of the industry should provide opportunities for profitable new business ventures. Both would be an important contribution to the national well-being.

In order to realize the production potentials of the industry and reduce unit costs, present excess manpower must be utilized more efficiently and better management and financial practices must be initiated. Some working capital will have to be provided for private companies to tide them over the modernization period. Government factories must be put on an earning basis and their administration simplified and divorced from the present over-centralized control. We believe it to be highly desirable that, as soon as is practicable, Government textile mills should be disposed of to private interests so that the full measure of efficient, competitive operation can be attained.

For the major task of rehabilitation, we recommend that a pool of foreign experts and Iranian technicians be created to inspect plants, to determine needs, to assist in obtain-

ing repair parts, to install and adjust machines, and to instruct operators in improved techniques. The pool should be organized into teams, composed of foreign experts and Iranians, and should be made available to both Government and private plants, possibly on a cost basis. Thorough inspections should be made of all plants.

The pool of foreign technicians, which might number from 16 to 20 individuals, should include specialists in the following:

Cotton spinning
Cotton weaving
Breaching, dyeing, printing and finishing
Engraving copper print rolls
Steam boilers and turbines
Diesel engines and generators.

It is estimated that initially the annual cost of these foreign experts would be about Rls. 4,000,000, of which approximately Rls. 2,450,000 would be in foreign exchange. The estimated annual cost of their Iranian counterparts would be Rls. 2,700,000, or a total initial annual cost of approximately Rls. 6,700,000. As the Iranian personnel become trained and familiar with the work, the annual cost of the foreign experts would be eliminated after the year 1329.

The Plan Organization should assist in expediting orders placed for repair parts and other needed equipment recommended by the rehabilitation teams. Exchange for such purposes should be made available at the official rate or some other favorable rate, which should be guaranteed until the receipt of goods and final payment for them. No foreign exchange should be provided for rehabilitation or expansion purposes without approval of the Plan Organization.

In addition, the Bank Melli or some other appropriate agency of Government should be authorized to grant short-term loans at low interest for rehabilitation purposes and to meet working capital needs. Such loans should be made with appropriate collateral and subject to Plan Organization approval.

With regard to specific projects, we have recommended elsewhere that a central steam plant, probably to be located at Shahi, of about 10,000 kilowatt capacity be developed to supply power for the Babul-Shahi-Sari-Behshahr area to supply energy to all industries in the district.

With regard to the new Tehran mill, it is recommended that no further steps be taken for ordering machines until negotiations have been completed with Germany for the machines already ordered and partially paid for, and until the equipment in Tehran and in Hamburg and other German cities has been checked thoroughly as to completeness and usability.

About 50 per cent of the Iranian consumption of cotton piece goods is in the form of printed cloth, but the domestic textile industry is completely dependent upon foreign sources for its designs and the manufacture of printing rolls. We recommend that a company be organized in a central location to perform these functions. The company would create new designs suitable to Iranian tastes, and would furnish the completed rolls to the mills. The extra cost of shipping heavy rolls abroad for re-work would be thus eliminated and the time required for the receipt of new designs and rolls would be greatly reduced. Copper rolls could be re-worked when new designs were to be printed.

The estimated cost of the proposed engraving plant would be Rls. 3,000,000, of which over 2,000,000 would be for foreign exchange.

There is a small amount of mercerizing equipment in Iran; we do not believe that it would be advisable to expand it until mass purchasing power becomes sufficient to absorb an increasing quantity of luxury goods.

We recommend that, as a temporary measure, existing surplus manpower be used more efficiently by changing from the present 10- to 12- hour two-shift operation to three 8-hour shifts. This would make possible better utilization of the present labor supply and would increase production materially without increasing total payrolls. We do not believe, however, that, as a permanent practice, three-shift operation of textile mills is advisable. The possibility of instituting some form of incentive payment, suitable to Iranian requirements and psychology, should be investigated.

We recommend that, as far as possible, surplus executive and administrative personnel in Government-operated plants be reduced in number, either by securing employment for them elsewhere or by granting equitable separation pay.

It is essential that the Plan Organization take an active part in stimulating and assisting in the adoption of sound management policies and in improving the general quality of management. Its efforts should include promotion of improved accounting, the setting up of adequate depreciation and other reserves, more realistic management of working capital, and better purchasing, merchandising and selling methods. Perhaps the best means of accomplishing this purpose would be to create a pool of management and accounting experts, composed both of foreign and Iranian technicians, to serve both Government factories and private companies, preferably on a cost basis. Adoption of satisfactory accounting methods and the setting up of adequate reserves should be a prerequisite to Plan Organization approval of applications for working capital or improvement loans.

The Plan Organization should request the appropriate agencies of Government to enforce the commercial code regarding the responsibility of company officers and other officials or, if the code is deficient in this respect, to suggest appropriate revisions to it.

It should be the policy of the Plan Organization to encourage and assist in the orderly development of the cotton textile industry upon a decentralized basis in keeping with the potentialities and needs of various sections of the nation, bearing in mind considerations of nearness to markets and raw materials, labor supply, available power and water, and similar factors. In this respect, we recommend that the present tendency toward the over-centralization of the textile industry, especially in Tehran and Ostan 2, be discouraged. It is our opinion that a more balanced regional development is both practicable and desirable. We have prepared a tentative program for the relocation of 165,400 spindles of the contemplated expansion program, the details of which are shown on Exhibit K-I. This exhibit should not be regarded as a finished study; it is merely illustrative of what could be done. Further study would, of course, be necessary before final conclusions can be reached. The suggested new locations have been selected, having in mind the available markets, the supply of raw materials and labor, and other factors mentioned previously. Meshed, Tabriz, and Kerman seem to be especially promising areas. Greater cotton crops are to be expected in these regions, the labor supply is ample, they have present or potential supplies of power, and are near the center of large consuming areas.

We strongly recommend that the Plan Organization use its influence to encourage and assist in the establishment of balanced units of not less than about 20,000 spindles in place of the many small, uneconomical units now proposed.

We believe that much of the work of directing relocation and establishing larger and more economical units can be accomplished through education and counsel. In some instances, however, it may require active assistance in securing additional capital and the Plan Organization should be prepared to lend its good offices in this direction for sound undertakings. The Plan Organization should refuse to approve the granting of exchange or of short-term loans for projects which are inconsistent with sound economic development and the national interest, and its authority in this matter should be final.

We recommend that the Government textile factories be placed in the best possible working order and put on an earning basis, following which they should be disposed of to private enterprise with proper safeguards against the creation of private monopoly. Government companies should be required to publish annual balance sheets and profit and loss statements.

Until such time as domestic production of raw cotton is large enough to meet manufacturing needs, means should be taken to encourage its importation, thereby giving employment to Iranian labor rather than importing finished cotton textiles.

Our allocations of Plan funds by periods to the various projects outlined above are shown in Exhibit K-2.

SILK

The silk industry of Iran is entirely in the hands of the Government. A Government monopoly controls the product from the purchase of the mother stock for sericulture to the finished fabric. Two Government-owned plants, one at Resht and the other at Chalus, reel the raw silk, while the production of fabrics is concentrated in the Chalus factory.

In recent years, raw silk production has averaged about 2,500 bales or 150,000 kilograms annually. Annual cloth production has been about 1,500,000 meters with an average weight of around 110 grams per linear meter. Production has been substantially below the capacity of the Chalus plant. In general, the type of cloth produced is too heavy for the American and European trade, and therefore either must be consumed domestically or else exported to other Middle Eastern countries or India.

In common with other silk-producing areas, Iran is feeling increasingly the competition of synthetic yarns such as rayon and nylon, whose lower price, more uniform quality, and greater utility for some purposes are winning an ever-widening acceptance. However, the softness and resilience of good quality silk fabrics still make them attractive to the luxury and semi-luxury markets.

The probability of growing competition from synthetic yarns and the limited domestic market for higher-priced merchandise make it inadvisable to expand Iran's silk industry beyond its present capacity. Rather, effort should be devoted to attaining greater operating efficiency and a higher and more uniform quality of product and to developing more effective merchandising methods.

Achieving these goals requires an integrated attack upon the problems faced at all of the successive stages of silk production. Therefore, it has been necessary for us to

study the present methods of sericulture, cocoon purchasing and drying, raw silk reeling, weaving, and finishing.

There are approximately 200,000,000 mulberry trees in Iran, over 87 per cent of which are located in Gilan, 5 per cent each in Khorassan and Mazandaran, and the remainder in the Azarbaijan and Isfahan-Kashan-Natanz-Yezd areas. As far as we were able to observe, the bush type of mulberry is not cultivated in Iran. Total annual production of mulberry leaves suitable for worm rearing is about 22,500 metric tons.

Sericulture, or the rearing of silkworms, begins with the selection of the eggs or "seeds" to assure a healthy stock suitable for each district. The Silk Monopoly each year purchases about 18,000 boxes of 25 grams each for its mother stock from France and Bulgaria. These eggs are disease-free and are produced by the cellular method. The eggs are distributed to farmers who raise the worms under the direction of the breeding stations. The cocoons are purchased from these farmers and are taken to the breeding stations for the moths to emerge.

Cocoons are visually inspected for signs of the diseases of flacherie or glasserie. If these are present, the cocoons are sent to the dryer and used for reeling raw silk. If the appearance of the cocoon is satisfactory, the moths are allowed to emerge and reproduce by the cellular method, in which the mother moth is kept identified with her eggs until a microscopic examination has been made of her body for pebrine spores.

The breeding season covers approximately 45 days, and the microscopic examination another 65 days, during which periods around 200 workers are employed in each of the monopoly's five breeding stations. Incidence of pebrine is said to be less than 0.5 per cent. The approximate total egg production is 95,000 25-gram boxes; 25,000 from Pahlevi; 20,000 each from Resht, Natanz, and Tarbat; and 10,000 from Tabriz. This method of egg production is expensive in that it is seasonal, of short duration and requires a large number of well-trained workers.

There are 16 cocoon-buying stations equipped with dryers to which the farmers bring their cocoons for inspection, grading, and weighing. These, which we examined, were equipped with cocoon dryers of Italian make with a drying capacity of 6 tons of fresh cocoons in 24 hours. The buying stations usually operate less than one month during the year. Drying reduces the weight to about one-third of the fresh cocoons.

The Chalus and Resht mills both employ the obsolete French system of reeling. The Chalus mill has 360 basins and the Resht mill 120, although only about half of the latter are in operating condition.

The Japanese system, which involves the use of a continuous cocoon boiler, and re-reeling, produces a much better raw silk thread with less waste and at a somewhat lower cost.

Use of a continuous boiler makes possible proper preparation of cocoons for reeling by the sunken system. Besides softening the natural gum (sericin) which facilitates unwinding, this method also fills the cocoon with water, thus giving the necessary weight to permit the removal of kinks in the filament as it is unwound. Moreover, it eliminates steam and dampness from the reeling room, reduces the number of workers needed, and improves the condition of the cocoons for reeling.

Use of re-reeling frees the skein from gum spots and facilitates subsequent unwinding operations. In the case of heavy threads, such as warp singles for satins which

range from 60 to 100 deniers, it eliminates several steps from the process and results in a superior product.

The present reeling equipment can be readily adapted to the re-reeling system by replacing the large skein-size take-up frame by one 15 cm in diameter. This work can be done locally and at relatively low cost. When filled and while the raw silk is still wet, the thread is drawn over the end of this frame and formed into a full-sized skein with diamond crossing in the heated compartment of the re-reeling equipment. In the case of the 60 to 100 denier threads, the raw silk can be reeled from the basin directly on to warping bobbins by running the thread over a wick saturated with a silk-soaking solution placed immediately ahead of the bobbin.

The Chalus mill contains 220 looms with auxiliary equipment, but the throwing department and steam-generating capacity are insufficient and only 150 looms can be operated. The finishing department has a roll printing machine which has had no new designs since before the war. Silk fabrics being a luxury product, a wide variety of designs in relatively small quantities is desirable and roll printing is not practicable. There is one German 24-section full-fashioned hosiery machine which produces a complete stocking with a single carrier. While special care is taken to supply this unit with high grade silk to produce a uniform product, it will be necessary to equip it with three carrier attachments if rings are to be eliminated in the sheer hosiery produced. The Chalus power plant requires complete rehabilitation as the boilers are worn out and the engines inefficient.

CONCLUSIONS AND RECOMMENDATIONS

The situation faced by the Iranian silk industry is one of obsolete methods, obsolete or worn-out equipment, and a comparatively static or even possibly declining market. Expansion, therefore, cannot be justified and effort must be directed toward greater operating efficiency, higher and more uniform quality of product, improved and more attractive designs, and better selling methods. Improvements in methods must be made in all phases of the industry. The following recommendations are designed to effect these objectives.

With regard to mulberry growing, it is suggested that the bush type, as used in Japan, be investigated by the proposed Lahijan Experiment Station to determine whether this type would be suitable for the Caspian area.

Two improvements are recommended regarding sericulture; use of the continuous method of production, and the incubation of eggs in central co-operative establishments. The Japanese have found that the continuous production of eggs during the growing season of the mulberry leaf—April to October on the Caspian—makes possible the maximum production of eggs under fully-controlled conditions with a comparatively small staff of workers and specialists, and therefore at minimum cost. The acid shock method is used to start germination. Use of the continous production method not only would reduce operating costs but also would reduce the necessity of importing mother eggs.

It has been found that the most effective and economical method of incubation is in central co-operative establishments, especially if worms are fed to the second stage of their life cycle. Carefully controlled temperature during incubation and well-regulated feeding in the early stages ensure a strong, healthy worm. Hatcheries of this type can be operated with few employees, and leaf consumption in the early stages is small.

The change to this method would require a well-planned educational program, and we recommend that such a program be included as part of the agricultural extension activities.

A carefully-planned sericulture research program should be developed, preferably at the Agricultural Research Center planned for Lahijan; and an expert sericulturist, preferably from Japan, should be employed for this purpose.

Installation of a continuous cocoon boiler and the adoption of the Japanese re-reeling method for ordinary fine raw silk threads of 14 or 21 denier are recommended as aids to modernizing raw silk reeling.

The throwing, warping, weaving and finishing equipment are of suitable design and are adequate for their purposes. However, all of the equipment is in poor condition and needs thorough overhauling.

We recommend that all printing of silk at the Chalus mill be done by either the block or screen system. Printing designs can readily be made and applied in Iran. The roll printing machine should be released to one of the cotton mills for printing calico.

The hosiery machine should be equipped with three carrier attachments to eliminate rings in sheer hosiery.

Two new boilers and two new bleeder turbo-generator sets of 500 kw capacity each should be installed.

We believe that the Iranian silk industry will be better able to meet the challenge of competitive conditions if it is transferred to private ownership. We therefore recommend that, with the exception of egg production, the entire silk industry be transferred to private operation. A continued monopoly, or at least strict Government regulation of egg production, is essential if eggs are to be kept free of disease and cocoons are to be uniform in color, size, and reeling quality.

The estimated cost of rehabilitating and modernizing the silk industry is as follows:

	In Thousands of Rials		
	Domestic Expenditure	Foreign Exchange Needs	Total Expenditure
Continuous egg production station, including services of foreign sericulturist ...	800	300	1,100
Continuous cocoon boiler	200	600	800
Re-reeling department	700	—	700
Repair of throwing, weaving, and finishing machines	1,500	3,500	5,000
Rehabilitation of power plant	2,300	9,100	11,400
Total	5,500	13,500	19,000

Our allocations of Plan funds by periods to these projects are shown in Exhibit K-2.

WOOL

Because of inadequate statistics, it is impossible to estimate the total annual consumption of woolen products in Iran. Domestic utilization of wool was estimated in 1326 to be about 8,800 metric tons, 3,500 tons of which were used by the carpet industry, 2,700 tons by industrial factories for blankets and suitings, and 2,600 tons in home weaving. These estimates do not include a large, but unknown, amount of wool produced and

consumed by the tribesmen in making clothing, bed covering, tents, and rugs for their own use.

Raw wool production is sufficient to meet domestic needs and to leave for export between 25 and 30 per cent of the total annual supply. However, Iranian wool tends to be coarse and the importation of some finer Australian wool is necessary for the production of suitings. Woolen fabrics also are imported, 1326 volume amounting to 1,100 tons.

From our investigation, it appears that the use of camel's hair is confined to the tribes, mostly for the manufacture of rough rugs. Camel's hair cloth is a luxury product that commands high prices in American and European markets, and the export of camel's hair might be a valuable source of foreign exchange.

At the present time there is little or no grading of wool, with the result that fine and coarse fibers are not separated. This is a serious handicap to the woolen industry, as fine wools are needed for suitings and coarse fibers are better adapted to the requirements of the rug industry where stiffness, resilience and wearing quality are important.

There are nine modern woolen factories in Iran, all privately owned, the facilities of which total 26,128 spindles and 457 power looms. Annual production amounts to about 10,000 kilograms of yarn and 2,500,000 meters of cloth and blankets. A substantial amount of wool yarn is used in cotton spinning and weaving establishments for the manufacture of combination fabrics, such as heavy blankets, using a cotton warp and wool weft.

As in the case of cotton textiles, rehabilitation of plants is much needed by the woolen factories.

At the present time, substantially all of the 3,500 tons of yarn used by the carpet industry is spun by hand. By this method, the fine fibers are not properly separated from the coarse and, as a result, the fine fibers, which are desirable for the production of yarn for suitings, are wasted and the carpet yarns are not uniform or of good quality for the purpose. The establishment of new woolen factories to produce yarns for the rug industry and yarns and cloth for suitings would minimize the present great waste involved in hand spinning and would make possible the salvage of the finer fibers for the production of suitings and similar fabrics.

RECOMMENDATIONS

As the woolen industry should be able to obtain adequately graded raw materials, the wool grading and standardization program recommended in the agricultural section of this report should be put into operation as soon as practicable. The grading and standardization of the domestic product will produce sufficient fine-fibered wool to reduce substantially, or possibly even to eliminate, the necessity of importations from Australia.

The possibility of exporting camel's hair should be investigated.

Inspection, overhauling and replacement of worn-out parts and equipment in the factories should be carried out with the aid of the Plan Organization in the manner recommended for the cotton textile industry.

We recommend that immediate plans be drawn up for the construction of five woolen mills, each capable of producing about 600 tons of yarn per year. About 75 per cent of this production would consist of coarse yarn for the rug trade and the remainder

would be woven into clothing fabrics. Tabriz, Kerman, Kermanshah, and some of the other wool-producing and manufacturing centers are suggested as suitable sites for these plants. We roughly estimate the cost of such plants at Rls. 40,000,000 each. These mills should be privately owned and operated; the Plan Organization should, however, be prepared to furnish whatever financial assistance is needed for construction. In our allocation of Plan funds in Exhibit K-2 we have provided for a loan of up to 50 per cent, largely for foreign exchange requirements.

JUTE

Annual requirements of jute cloth, as estimated by the Ministry of National Economy, are 10,000,000 square meters, 75 per cent of which is used in the form of bags for rice, sugar, flour and cement, and the remainder for cotton bales and for wrapping other products. Double bags are usually used for export shipment, single bags for trade within the country, and second-hand bags for coarse materials, especially charcoal.

Much of the cloth woven is 140 centimeters wide. It is then cut to one meter length, doubled, and sewed to form bags 70 centimeters wide and one meter in height. Resht bags made in this manner weigh about 750 grams each, while the closer woven Shahi bags weigh about 800 grams.

Most of the jute is grown in the Caspian area, principally around Resht, although an attempt is being made to cultivate jute in the southwestern district around Dizful. Small quantities of raw jute and a substantial amount of fabric are imported from India.

At present two jute mills are in operation in Iran. There is a privately-owned plant at Resht equipped with modern Scotch machinery including 2,100 spindles and 80 looms. Operating on two 8-hour shifts, this plant can produce about 4,500,000 meters of cloth annually, using 3,000 tons of fiber. A Government-owned mill at Shahi, also equipped with modern Scotch machinery, has 1,280 spindles and 60 looms. Its annual production, working on two 8-hour shifts, is about 3,000,000 meters of cloth. Both mills are in fair condition, but require general overhauling.

A new, privately-owned mill is being planned for Dizful, but it will be at least two years before it is in production. As planned, it will have 30 looms and necessary auxiliary equipment.

CONCLUSIONS AND RECOMMENDATIONS

Both of the existing jute mills should be overhauled and put into good working order. If this is done, their capacity, with that of the planned Dizful mill, should be able to meet the nation's total requirements for jute cloth. The estimated cost of rehabilitating the Government's jute plant at Shahi is Rls. 5,000,000, of which Rls. 3,000,000 would be for foreign exchange. Our allocation of Plan funds by periods for this project is shown in Exhibit K-2.

CARPETS AND RUGS

Persian rugs are known throughout the world for their beauty of design and color, expert workmanship, and excellent wearing qualities. For many years they have been a principal export of Iran; in recent years 75 per cent of the rugs produced has been exported. In 1325, the best postwar year, exports of rugs amounted to 3,667 metric tons

valued at Rls. 615,000,000, or about 24 per cent of the total value of Iranian exports, exclusive of petroleum products. Exports declined by about 27 per cent in volume and 30 per cent in value in 1326 and, although the volume for the first nine months of 1327 was at a higher annual rate even than 1325, the prices received were almost 20 per cent below those of the latter year.

The rug industry of Iran is faced with a basic economic problem which arises from three sources: changes in market demand, increased production costs, and increased competition from machine-made rugs. Plain broadloom rugs, which can be manufactured more cheaply than Persian rugs, are currently favored in the United States and elsewhere. Many European countries have imposed import quotas and duties upon luxury products in an endeavor to save exchange for essential commodities. Private exportation of rugs as a means of getting capital out of Iran, commodity exchange conducted with rugs as one of the items, and similar operations have helped to glut some overseas markets. Wages, which represent about 50 per cent of total production costs, have risen in recent years and further increases are in prospect. On a cost basis, the competitive position of Persian rugs with regard to mass markets is becoming increasingly disadvantageous.

Rug weaving is mainly a small-scale, home industry, although there are some establishments which have as many as 40 looms and employ 200 people.

It is estimated that the total number of rug weaving looms is about 250,000, with a total production of approximately 1,000,000 square meters annually. Tabriz, Hamadan, Kerman, Arak, Kashan, and Meshed are the principal rug-producing centers. Together with Shiraz and Birjand, they accounted for about 70 per cent of all rugs exported in the year 1325.

Direction of production is largely in the hands of exporters, who scour, flock dye, and card the wool and distribute it to the homes where it is spun on hand spinning wheels. The resulting yarn is very uneven and much wastage occurs. The exporters also contract for the weaving of rugs and to a large measure dictate the designs to be used. The Iranian Carpet Company, a Government-owned corporation, is the largest exporter, handling about 25 per cent of total rug exports.

The looms used are primitive, consisting essentially of two warping beams, set about 12 feet apart, which support the warping threads into which the knots are looped according to the predetermined design. The more intricate portions of the design are carried out by a master artisan, who leaves the ground spaces to be filled in by apprentices. Usually two warps are set up facing each other, approximately three feet apart, with a platform between them on which about five employees work. Rugs are generally woven in pairs.

Where a number of looms are installed in the same building and several carpets of the same design are desired, the master weaver reads the design from a paper on which the design is inscribed and calls out the position of each knot and the color of yarn to be used. This is the nearest approach to mass production that can be found in Iran's rug industry. Since a medium-grade rug contains 360,000 knots per square meter and the best weavers can make no more than from 1,000 to 1,500 knots an hour, it is evident that the labor represented by a Persian rug is enormous. The average production cost per square meter in 1325 was Rls. 1,095, of which 50 per cent represented labor, 35 per cent raw material, and 15 per cent overhead.

It is necessary to produce different types of rugs to meet the desires of major markets. American preference has been for a long-pile, thick carpet which is treated chemically in the United States to produce the sheen always associated there with Persian rugs. On the other hand, both Great Britain and the domestic market prefer short-cropped rugs which bring out the design in bold relief, without special chemical treatment.

CONCLUSIONS AND RECOMMENDATIONS

It is clear that the Iranian rug industry cannot compete on equal terms with the products of machine manufacture, such as broadloom rugs, and no attempt should be made to do so. In so far as the American market is concerned the industry should concentrate, at least until market conditions change, upon the production of high quality rugs adapted to the luxury trade. For other markets rugs of lower quality might find acceptance.

We recommend that, as far as may be practicable, the work of rug weaving be performed in homes as part-time work during seasons when weather conditions do not permit of working in the fields. The earnings of even the most expert rug makers are extremely low and compensation for weaving would thus become a supplementary source of income rather than their sole means of livelihood.

CEMENT

Cement is a basic commodity essential to any country whose economy is to progress. Its use is almost universal in the construction of highways, railroads, bridges, air fields, dams and canals for irrigation and hydro-electric projects, industrial and residential buildings, foundations for machinery and equipment, and municipal improvements such as water supply, sewers and streets.

Consumption of cement in Iran is very small as compared with that of most other countries. The following table, compiled from data obtained from Mineral Yearbook, an American publication, and from Iranian Government sources, shows consumption in Iran and several other countries in the year 1325:

Countries	Approximate Consumption In Thousands of Tons	Per Capita Consumption Per Annum In Kilograms
United States	27,500	190
Palestine	266	133
Venezuela	309	77
India	2,053	53
Syria and Lebanon	189	47
Peru	273	39
Colombia	377	37
Egypt	588	31
Tunisia	83	28
Brazil	950	20
Turkey	325	17
Iran	66	4

The period from 1315 to 1319, inclusive, was one of great activity in railroad construction and other developments, and the average annual consumption of cement in Iran at that time was almost 2.5 times that of 1325, but it still was low compared to other countries.

There is only one cement mill in Iran. It is located about six kilometers east of Tehran and is owned and operated by the Industrial and Mining Bank. It started operations in 1312 (1933) with one kiln with a rated capacity of 100 tons per day. In 1316 a second and larger kiln was added, increasing the capacity to 300 tons per day. Actual production reached a maximum of about 70,000 tons in 1319, or 233 tons per day on the basis of 300 operating days per year. Thereafter, the annual production declined to 23,200 tons in 1324, due largely to the fact that repair parts and refractory brick could not be imported. Since 1324 production has increased, reaching 58,000 tons in 1327, or a daily average of 193 tons.

Imports of cement have been substantial except during the war years. Anglo-Iranian Oil Company is permitted to import cement for its own use duty free; other imports are subject to an ad valorem duty of 16 per cent and customs charges of Rls. 30 per ton. The following table, compiled from data furnished by Government sources, shows annual production and imports of cement, the price charged by the Government f.o.b. its plant near Tehran and, for recent years, the free market price:

	In Thousands of Tons				In Rials per Ton	
Year	Production	Dutiable Imports	Duty Free Imports	Total	Government Price	Free Market Price
1312	1.0	(a)	(a)	(a)	600	—
1313	24.8	(a)	(a)	(a)	600	—
1314	29.6	(a)	(a)	(a)	700	—
1315	26.0	153.9	20.5	200.4	800	—
1316	51.2	81.0	28.5	160.7	800	—
1317	65.0	4.0	46.1	115.1	800	—
1318	68.7	4.9	85.1	158.7	900	—
1319	69.7	84.4	1.6	155.7	900	—
1320	58.4	24.5	6.0	88.9	800	—
1321	60.8	10.3	18.8	99.9	900	—
1322	42.0	0.6	5.5	48.1	1,100	—
1323	38.2	3.0	11.7	52.9	1,800	1,900
1324	23.2	17.1	1.2	41.5	1,800	2,000
1325	37.4	24.2	4.7	66.3	1,800	2,000
1326	42.3	5.1	35.6	83.0	1,800	2,200
1327	57.9	(a)	(a)	(a)	2,200	3,000

(a) Data not available.

Apart from its scarcity, the high cost of cement in Iran has been a major deterrent to its use. The present Government price of Rls. 2,200 per ton compares with Rls. 439 per ton, the rial equivalent at Rls. 32.5 to the dollar of the present price in the United States. To this high cost must be added high transportation charges which, on a ton-kilometer basis, are several times greater than American freight charges. The total delivered cost of a ton of cement at Tabriz would be about Rls. 2,900 and at Meshed or Shiraz about Rls. 3,400.

The equipment at the Tehran mill is in bad condition due to continuous hard service during and since the war when suitable repair parts were not available, and to inadequate maintenance. It is probable that some of the equipment, such as hammer mills, grinding mills, and boilers, will have to be replaced soon.

Operating costs are inordinately high because of manual operation in the quarry, grossly excessive labor and administrative staffs, and frequent shutdowns due to the breakdown of equipment and the short life of the domestically-manufactured refractory

brick. The labor force in 1327 totalled 1,100 men, of whom 30 were supervisors, 570 plant laborers, 400 quarry laborers, and 100 construction laborers. We were informed that at present employees number 1,200. To illustrate the extent to which the plant is overstaffed it may be cited that a modern mechanized 300-ton plant in the United States would require less than 100 employees.

There are no facilities for the storage of clay, and during the rainy season shutdowns frequently occur because of inability to handle wet clay. Coal storage facilities also are inadequate, and emergency purchases of high-cost, low-grade coal are occasionally necessary.

The quality of the cement produced varies widely because of lack of storage and blending facilities which would provide for a raw material mix of uniform chemical analysis.

CONCLUSIONS AND RECOMMENDATIONS

There can be no doubt as to the immediate need of more cement for the development of the Plan Organization program. The principal question for decision is whether additional capacity should be provided at the Tehran plant or other plants be built elsewhere.

Cement is a heavy commodity and for this reason plants should be located as close to consuming centers as is consistent with economical size and the availability and cost of fuel, power, and raw material. The capital cost of a plant of 300 tons daily capacity would be only about 80 per cent more than that of a 100-ton plant. A 200-ton plant would cost about 60 per cent more than a 100-ton plant; also, there would be considerable economy in operating cost in the larger plants.

The selection of the actual site for a cement plant is a matter of great importance. The principal raw materials required, limestone, clay, and, less importantly, gypsum, are found in many parts of Iran. A reasonable degree of uniformity in the deposits, however, is desirable. The site of a new plant, therefore, should be chosen only after exhaustive checks, including core drilling, have been made by competent specialists to determine both the quality and quantity of the available raw material.

About one year ago proposals were requested by the Industrial and Mining Bank for the enlargement of the Tehran cement mill to a capacity of 600 tons per day and, in connection therewith, for a new electric generating plant with two 5,000 kw turbogenerators and a 69,000 volt transmission line to Tehran. The power plant would be located at Fasham, about 25 kilometers north of Tehran, and would use coal from the Shemshak mine, 15 kilometers distant. About 2,500 kw would be required for the enlarged cement mill, 3,500 would be used by other factories of the Industrial Bank, and 4,000 would be available for sale to the municipally-owned power company of Tehran. Bids have been received from a number of American and European firms, but they are not on a strictly comparable basis. Most of them call for a new 300-ton cement mill largely independent of the existing mill, while others propose an integrated plant with a capacity of 600 tons per day. The most complete proposal was made by Westinghouse Electric International Company with cement machinery to be furnished by Kennedy-Van Saun Manufacturing and Engineering Corporation. It includes power shovels and trucks for mechanized quarry operations, crushing and blending plants and storage bins for raw materials, all

of which would serve the integrated plant of 600 tons capacity. A new kiln of 300 tons daily capacity would be equipped with a waste heat boiler which would replace the existing boilers furnishing steam to the present turbogenerators. The present boilers would be scrapped.

It seems probable that if enlargement of the Tehran mill were proceeded with at once an increased amount of cement would be available more quickly than if the plant were merely rehabilitated and new plants erected elsewhere. In our opinion the implementation of the Seven Year Plan may require a total productive capacity of more than 1,000 tons per day within five years, and for this reason it might seem desirable to proceed at once with the enlargement of the Tehran mill.

However, enlargement of the mill to 600 tons daily would concentrate all the capacity at Tehran for a considerable time and would not contribute in any way to economies in distribution. Indeed, a probable result would be that most of the cement would be used in the Tehran area and that other areas would still be supplied inadequately. Further, enlargement of the Tehran mill would necessarily be a project of the Government and would tend to increase rather than decrease the participation of government in business. As stated elsewhere in this report, we strongly believe that the object of the Government should be to rid itself of business enterprises.

If smaller plants of about 200 tons daily capacity were built in such locations as in the Karun River Valley and in the vicinity of Shiraz or Isfahan, more economical distribution would be possible. The former should be located on the railroad as near to the port as possible so that, in addition to supplying the Provinces of Khuzistan, Kermanshah and Kurdistan, it could compete for the cement requirements of all the oil companies in the Persian Gulf area whose consumption is likely to be in excess of 100,000 tons annually over the next few years. If a firm commitment could be secured from Anglo-Iranian Oil Company to buy a fixed amount of cement annually over a period of several years, the capacity of the proposed Karun River Valley cement plant could be increased by the amount of such commitment. The Shiraz or Isfahan plant would supply cement to areas not served by a railroad, including the cities of Kerman and Yezd. In addition to the two plants discussed above, it is probable that three more 200 ton per day cement mills will be needed later, one of them being located in the Tabriz area and another near Meshed.

The erection of the Karun River Valley and of the Shiraz or Isfahan plants would probably take more time than the enlargement of the Tehran plant and therefore cement would probably be in short supply for a longer time, but the advantages to be gained by their establishment would, in our opinion, far outweigh the disadvantages caused by such delay. Temporary shortages, if sufficiently pressing, could be taken care of by imports. We believe that it would be possible to interest private capital in building the new plants and that it would be a wise policy for the Plan Organization to encourage this if necessary by extending financial assistance.

We therefore recommend against enlargement of the Tehran plant at this time. It should, of course, be rehabilitated with the least possible delay.

The cost of the 200 tons per day plants recommended above would depend upon the degree of mechanization and the quality of equipment. It is probable that a modern plant of American design and manufacture would cost more than one of European design, but would be more economical in operating costs and would produce cement of

higher quality. Selection of equipment, as well as of the actual sites, should be made only upon the recommendation of competent disinterested engineers experienced in the design and operation of cement plants but not affiliated with a machinery manufacturer. We estimate roughly the cost of a modern American plant with a capacity of 200 tons per day, including a power plant, erected in Iran at from Rls. 130,000,000 to Rls. 160,000,000, of which about 75 per cent would be required for foreign exchange.

Essential repairs to the Tehran plant which would restore its capacity to 300 tons per day could be effected for about Rls. 36,000,000, of which Rls. 25,000,000 would be required for foreign exchange. Modernization, including installation of a large rock crusher, mechanization of the quarry, and provision of clay and coal storage, would cost much more and in our opinion would not be justifiable at this time.

The allocation of Plan funds for the cement industry is shown in Exhibit K-3.

OTHER CONSTRUCTION MATERIALS

Practically every phase of the Seven Year Plan will call for large quantities of construction materials of all kinds. Some of the more important materials such as brick, plaster, lime, and clay and gypsum products are manufactured in many localities, but data as to the quantities are lacking. Raw materials for these products are widely distributed throughout the country. No steel is produced in Iran and the domestic production of lumber is inadequate, even for present needs. Cement, cast iron pipe, and sheet glass are discussed elsewhere in this section.

With the exception of a Government-owned plant near Tehran, all brick-making plants are small, privately-owned units. Primitive hand methods are used and the bricks are not uniform in shape and color and generally are under-burned. In the Tehran area alone, there are 35 such plants equipped with small Hoffman kilns, each of which has a capacity of about 15,000 bricks per day. In addition, there are a number of smaller plants producing high quality bricks. It is not known how many brick plants are operated in other sections of the country.

The Government brick plant is equipped with one 26-room and one 32-room Hoffman kiln and produces an average of about 80,000 bricks per 24-hour day. The plant is shut down for several months of the year, however, because there are no sheds in which bricks can be air dried in wet weather. Hand methods are used throughout. In 1327 (1948), production was 20,000,000 bricks and the number of employees about 600. It is hoped to increase production to about 35,000,000 bricks, which, it is estimated, will require about 1,000 men. The operation generally is inefficient and manufacturing costs are high. The plant also has equipment for the manufacture of tile, as well as multiple saws for cutting marble and stone slabs, none of which is now in operable condition.

Quicklime and gypsum plaster of poor quality are made in many small plants scattered throughout the country. Hydrated lime is not made. Roof tiles are produced in the Caspian area but seemingly not to a large extent elsewhere. Some vitrified tile also is made.

Lumber is relatively scarce in Iran and is obtained principally in the Caspian area, from where it is transported, largely in the form of green sawn logs, to small sawmills in the cities and towns. Generally, the sawmills are inadequately equipped. Much of the lumber is used before being properly dried, and subsequent distortion affects the quality of the products and structures in which it is used.

CONCLUSIONS AND RECOMMENDATIONS

We recommend that the Government-owned brick plant be converted to mechanical operation, not only to reduce the excessive cost but to produce bricks of better and more uniform quality. Needed equipment would consist of disintegrating, extrusion and cutting machines and dryer cars. Sheds should be provided for air drying and the clay pit should be mechanized at least in part. We estimate the cost of this work at Rls. 6,500,000, of which Rls. 3,900,000 would be required for foreign exchange.

We believe that consideration should be given to the establishment of modern plants for the production of lime and gypsum plaster. We estimate that a gypsum plaster plant equipped with crushers, pulverizers, and two oil-fired calcining kettles, each with a capacity of 30 tons of plaster per 24-hour day, together with quarry and transportation equipment, but without a power plant, would cost about Rls. 10,000,000, of which about Rls. 7,000,000 would be required for foreign exchange. The cost of a single-unit plant with a capacity of 30 tons per day would be about Rls. 6,500,000. A plant such as this could produce by manual methods hollow gypsum block for use as interior partitions. The possibility of treating the blocks with a moisture-proof compound to permit of their use for exterior walls in arid regions should be studied.

A modern hydrated lime plant consisting of a crusher, rotary kiln hydrator, and grading and sacking equipment, with a capacity of 125 tons per 24-hour day, together with quarry and transportation equipment, but without a power plant, would cost about Rls. 25,000,000, of which about Rls. 18,000,000 would be required for foreign exchange. All the equipment used in such a plant, except the hydrator, is required for the production of cement and for this reason cement mills sometimes produce both lime and cement. Thus, it may be desirable to produce hydrated lime in the proposed cement plants during the early periods of operation, pending the development of the market for full capacity cement production.

We believe that it would be possible to interest private capital in building the new gypsum and hydrated lime plants and that it would be a wise policy for the Plan Organization to encourage this if necessary by extending financial assistance up to a loan of fifty per cent of the cost.

We believe that the employment of two foreign technical advisers to assist in planning a development program for the important construction materials industry would be advisable. One of these men should be a specialist in the production of brick, lime, and plaster, and the other thoroughly experienced in the production of lumber. Their services would be required for at least two years and would cost about Rls. 1,200,000, of which about Rls. 800,000 would be required for foreign exchange.

The allocation of Plan funds for the construction materials industry is shown in Exhibit K-3.

ARMY MUNITIONS PLANTS

The Army munitions plants represent the largest aggregation of machines for the manufacture of metal products in Iran. Some of the equipment is of special purpose type, as required for the production of munitions, but most of the tools are general purpose machines suitable for the manufacture of a wide variety of civilian products.

The supervisory staff of the plants is comprised of Army officers, many of whom have been educated and trained in Europe and subsequently engaged in a particular branch of the munitions manufacturing operations on a permanent basis.

The primary purpose of these facilities has been, and should continue to be, to produce armaments and munitions. We are advised, however, that the full capacity has not been used and that, based on the estimated future needs of the Army, a considerable surplus capacity is available.

This surplus capacity, in our opinion, should be used for the production of many types of civilian products. In order to provide a balanced manufacturing operation, it would be necessary to supplement the existing facilities with additional machine tool equipment, particularly sheet metal stamping and forming presses, and with a new foundry, with a capacity considerably greater than the present one, for the production of ferrous and non-ferrous castings.

We believe that arrangements should be made between the Ministry of War and the Plan Organization for utilizing these plants for civilian production. Many kinds of agricultural tools and machinery, as well as other civilian products, could be manufactured. There should be established also a separate department functioning as a job shop to produce repair parts for industrial plants, which otherwise would have to be imported. It would be possible to establish an apprentice school for the training of skilled mechanics for service to industry throughout Iran. The value of a body of skilled workers, not only in time of peace but also in time of national emergency, is obvious.

The first step in implementing the foregoing program would be to undertake, with the help of foreign specialists in machine shop and foundry operations, a thorough study of the present facilities and markets in order to determine the following:

1. The equipment which must be reserved for the manufacture of munitions
2. The civilian goods, manufacture of which could be immediately started with the existing equipment
3. The civilian goods of the many types needed which could be most advantageously manufactured in a properly balanced plant
4. The additional facilities needed to carry out the program established under 3
5. Layout of the foundry and machine shops on the basis of the fullest possible utilization of the existing buildings.

We recommend the formation, after the completion of the above study, of a joint stock company to operate the expanded factories. Arrangements for its operation and ownership should be made between the Plan Organization and the Ministry of War. The company should be operated as a profit-making enterprise, both civilian and military goods being sold on a commercial basis. Plan funds should be made available to the new company to provide for the expansion of facilities and working capital. The allocation of funds for this purpose is shown in Exhibit K-3.

SUGAR

Annual consumption of sugar in Iran since the war has been about 135,000 tons, slightly more than two-thirds of which has been imported cane sugar and the remainder domestically produced from beets. Sugar is a principal item of import, accounting for about 22 per cent in value of all imports in 1325 and 12 per cent in 1326. With improved economic conditions and a possible reduction in price, consumption may increase to 150,000 tons per year or more, and we believe that future plans should be made upon this assumption.

Production and marketing of sugar is almost entirely in the hands of the Government. The Ministry of Agriculture develops mother sugar beet seeds and contracts with selected farmers to grow commercial seeds in areas where conditions are similar to those in which the beet sugar factories are located. Beet sugar is produced in Government factories which are under the direction of the Industrial and Mining Bank. The factories buy the commercial seeds from the Ministry of Agriculture and distribute them without charge to contract beet growers. The distribution of both imported and domestic sugar is in the hands of the Sugar Monopoly, a department of the Ministry of Finance.

Sugar beets are usually planted in the early spring and harvested over a period of about three months in the late fall. The beets must be dug soon after reaching maturity and should be processed within ten days. Thus, the operating season of the factories is determined by the length of the harvesting season, which averages about 100 days. Some other countries have lengthened their seasons to 120 days or more by storing beets in the field in earth-covered bunkers immediately after they have been dug. The longer operating season enables factories to increase annual production and thus reduce unit costs. In Iran, this practice is followed only at Abkuh.

Before the planting season, the factories contract with landlords and peasants for the purchase of all beets harvested at a fixed price per ton in the field. Beets are delivered to the factory by the growers, who are paid for transporting them at the rate of three rials per ton kilometer up to a maximum of 90 kilometers.

The yield of beets per hectare is generally low, and varies widely among areas. The following table shows for the various factory areas in the year 1326 the average yield, the prices paid to farmers, and the average transportation cost per ton to the factories:

Factory Area	Yield (Tons Per Hectare)	Price to Farmers (Rials Per Ton)	Transport Cost (Rials Per Ton)
Karizak	10.0	666	154
Karaj	7.7	666	282
Shazand	7.2	600	390
Shah-abad	9.6	666	324
Marv-dasht	15.8	600	203
Abkuh	15.8	600	215
Miandoab	7.3	600	200
All factories	11.5	616	248

That higher yields are possible is indicated by reported yields up to 50 tons per hectare in some sections of the Marv-dasht and Abkuh areas, where ample supplies of

manure and water were available. According to data furnished by the Industrial and Mining Bank, yields in tons per hectare in other producing countries were as follows:

	Tons Per Hectare		Tons Per Hectare
Bulgaria	12.0	Spain	18.4
Roumania	13.3	Yugoslavia	25.0
Turkey	14.7	Italy	27.3
Hungary	15.9	Holland	35.7
Poland	17.9	Switzerland	40.6

The cost of producing beet sugar is high. According to data obtained from the Industrial and Mining Bank, the relative importance of the principal elements of factory cost in the year 1325 were as follows:

	Percentage of Total Cost					
Factory	Beets	Seed	Transportation	Labor and Supervision	Other	Total
Karizak	35.5	2.2	9.5	25.3	27.5	100.0
Karaj	42.8	3.3	19.0	13.9	21.0	100.0
Shazand	44.2	5.9	23.8	13.2	12.9	100.0
Shah-abad	37.7	6.2	22.5	19.7	13.9	100.0
Marv-dasht	50.5	3.4	20.8	10.5	14.8	100.0
Abkuh	46.5	3.2	17.6	13.1	19.6	100.0
Miandoab	44.7	6.2	16.3	11.4	21.4	100.0
All factories	44.8	4.4	19.0	13.7	18.1	

The actual factory costs of sugar in 1325 in rials per kilogram were as follows:

	Rials Per Kilogram
Karizak	15.4
Karaj	12.4
Shazand	11.9
Shah-abad	13.7
Marv-dasht	8.1
Abkuh	11.4
Miandoab	9.3
All factories	10.8

To these costs, Rls. 0.8 per kg should be added to cover overhead costs of the Industrial and Mining Bank.

The principal elements of cost are the prices paid to farmers and the transportation of beets to the factories. In 1325 these costs together averaged 63.8 per cent of total costs. It is obvious that increased production per hectare would not only make possible a lower price to farmers, but also reduce transportation cost by allowing the concentration of production in areas nearer the factories.

Except at Abkuh, where beet pulp after extraction of the sugar content, is sold in moist form at a low price for conversion into fuel, and at Karaj, where some of the molasses is sold for the manufacture of alcohol, the valuable by-products of the beet mills are wasted. Beet pulp and molasses are both valuable as feed for cattle and should be especially prized in Iran, where cattle feed is scarce. Beet pulp can be used in a semi-moist state, can be mixed with other nutrients, or can be dried in the form of pellets which

are especially suitable for range feeding. Molasses, sometimes diluted with water, may be sprinkled on straw or poor-grade hay to make it more palatable and to increase its nutritive value.

There are eight beet sugar plants in Iran, seven of which are in operation. The oldest of these, at Karizak, was built in 1274 (1895). After some years it was closed down, but was re-opened in 1311 (1932). A second factory, at Karaj, was built in 1311. Six additional plants were purchased from Skoda in 1312 (1933). Two of the sites designated for these plants, Shahi and Veramin, were found to be unsuitable owing to unavailability of beets. The equipment of the Shahi plant was moved and erected at Shazand, and part of that of the Veramin plant was moved to Marv-dasht but has not yet been installed there. The locations and rated capacities of the active beet sugar plants are as follows:

Location	Rated Capacity Tons of Beets Per Day
Karizak	120
Karaj	300
Shazand	300
Shah-abad	300
Marv-dasht	650
Abkuh	650
Miandoab	650
Total Daily Capacity	2,970

With an average of 100 days' operation per year and at a sugar yield of 15 per cent, the annual capacity of these plants would be about 44,500 tons of sugar. The maximum reported production in any year was 52,447 tons in 1326.

With the exception of the Karizak plant which is old and much too small for economical operation, the plants are modern, well arranged, and generally in good condition.

CONCLUSIONS AND RECOMMENDATIONS

Some years ago two plants, each with a capacity of 700 tons of beets per day, were ordered from Skoda, and the first shipment of equipment arrived recently at Khorramshahr. The total cost of these plants is estimated at Rls. 385,000,000, of which Rls. 59,000,000 have already been paid, leaving a balance of Rls. 326,000,000, of which Rls. 113,000,000 will be required for foreign exchange. We have been advised that the total balance must be provided from Plan funds, as the Industrial and Mining Bank has not sufficient funds available.

A special commission, appointed to determine the most favorable locations for these plants, recommended that Rezaiyeh in Azarbaijan and Turbat-i-Haidari in Khorassan be chosen. Recently, however, the Government directed that the factory recommended for Turbat-i-Haidari be located near Fassa in the province of Fars. We recommend that this decision be rescinded, and that the plant be located at Turbat-i-Haidari, as originally recommended by the commission. We are informed that there is not enough water in the Fassa area to assure a supply of beets within economic distances sufficient for a 700-ton-per-day factory. Further, the Fassa area is suitable for growing cotton, which is a more valuable crop and needed by the textile mills at Shiraz and Bushire.

Plans have been made to use the buildings and equipment remaining at the Veramin factory as the nucleus for a cane sugar refinery which, with additional new machinery, would have an annual capacity of 25,000 tons. Imported raw sugar would be used. The additional equipment was ordered from Skoda, but was not delivered because of the war. Negotiations are now proceeding with Skoda to reinstate the order. In this instance, also, funds will have to be provided by the Plan Organization, and we have allocated Rls. 35,000,000 for this purpose, of which Rls. 30,000,000 is for foreign exchange.

When and if the area serving the Marv-dasht factory is furnished with additional water by irrigation, we recommend that the capacity of the factory be enlarged from 650 to 1,000 tons of beets per 24-hour day by the installation of the equipment formerly installed at Veramin, and such new equipment as may be needed. The estimated cost of the expansion is Rls. 30,000,000, of which Rls. 21,000,000 would be required for foreign exchange.

Before the last war, experiments were conducted in the growing of cane sugar in the Karun River valley near Shushtar. Results of the experiments were not conclusive but were sufficiently encouraging to justify the expectation that, with proper selection of areas and types of plants, sugar cane can be produced successfully in this region. In the agricultural section of this report (Vol. III), it has been recommended that further experiments be made, results of which probably will not be definitely known for several years. If successful, it will be four or five years before sugar cane can be grown in sufficient amount to warrant the building of a cane-processing plant. Should the experimentation lead to the assurance of an adequate supply of sugar cane, we recommend the construction of a refinery near Ahwaz with a capacity of 25,000 tons, operating ten months per year, and of three raw cane sugar plants in the cane-growing areas. At a still later date, it might also be advisable to construct additional raw sugar plants to supply the Veramin refinery.

We have allocated Plan funds, to be spent during the late years of the program, as follows:

	In Thousand of Rials		
	Domestic	Foreign Exchange	Total
Ahwaz refinery	88,000	79,000	167,000
Three raw sugar mills	210,000	114,000	324,000
Total	298,000	193,000	491,000

Improvement in the beet yield per hectare appears to be an effective means of reducing the cost of production in the factories by lowering both beet and transportation costs. In the agricultural section of this report (Vol. III), the matter is discussed in detail and need not be repeated here. We suggest, however, that the practice of field storage, now used at Abkuh, be extended to other centers if found to be practicable, as this would enable beet factories to operate for a longer period each season and thus produce more sugar annually.

A suggestion has been made by the Provisional Planning Board that sugar factories purchase tractors for the use of farmers in their areas. We believe that it would be preferable for tractors to be privately owned. We understand that if service facilities were available many landlords would purchase them. It is possible that the repair shops at the sugar mills could be used for this purpose. In certain instances, a factory

might own a few tractors which could be used on a rental basis by farmers who are unable to purchase their own equipment, or to rent it from other sources.

The Provisional Planning Board has recommended that the development of mother seeds and the production of commercial seeds be carried on by the sugar factories. We believe that mother seeds should be developed by the proposed Agricultural Research Institute, since it will have the requisite staff of experts to carry on this work. The growth of commercial seeds could be made a function of the sugar factories if deemed advisable.

The Provisional Planning Board recommended the purchase of a 40 kw diesel auxiliary generator for each of the factories at Abkuh, Marv-dasht, and Miandoab, as well as industrial trucks and certain steam-controlling devices. We concur in these recommendations.

The Provisional Planning Board also recommended that all factories be furnished with drying equipment for beet pulp and suggested that any surplus pulp could be exported. We think that the high internal transportation costs, as well as ocean freight rates, would make export of these cheap materials impracticable. Moreover, considerable time may be needed to educate farmers to the use of the by-products as cattle feed. We recommend, therefore, that installation of drying equipment be limited to the two proposed new factories and the completion of the equipment at Karaj until acceptance of the product by farmers is assured. In this connection, the Provisional Planning Board recommended the installation of additional generators of 560 kw at each plant to operate the drying equipment. Inasmuch as each plant now has two such generators, one of which is spare, and as operation of the drying equipment could be suspended in case of emergency, we do not recommend the purchase of these extra generators.

If all the foregoing recommendations are carried out, the nominal sugar refining capacity of the country would be as follows:

	Tons
Existing beet sugar plants	44,500
Two additional beet sugar plants	25,000
Enlargement of the Marv-dasht plant	5,000
Veramin cane refinery	25,000
Ahwaz cane refinery	25,000
Total	124,500

In view of the possibility of operating the best plants for longer periods and of increasing to some degree the sugar content of beets, we believe that the actual annual capacity of the plants would be greater than that shown above. We do not think that any further expansion should be undertaken until the full capacities of the existing and immediately proposed plants have been established and until demand shall have substantially increased.

The recommended allocations of Plan funds in the sugar industry are shown in Exhibit K-3.

DRIED FRUIT PACKING

The agricultural section of this report (Vol. III) discusses the present situation with respect to the potentialities of dried fruit in Azarbaijan and recommends a project which would provide preliminary processing and drying equipment in the orchards

to handle about 100,000 tons of fresh fruits. This would require the erection of five final processing and packing plants, two with annual capacities of 6,000 tons of dried fruit each and three with capacities of 2,500 tons each.

We recommend that the two packing plants of 6,000 tons capacity each be constructed as soon as possible for operation by the fall of 1329.

In addition to allocation of funds recommended in the agricultural section of this report for preliminary processing equipment, we recommend the allocation of further funds for final processing and packing plants as shown in Exhibit K-3.

GRAIN ELEVATORS

The Cereals and Bread Administration, a department of the Ministry of Finance, owns and operates grain elevators which are used to store bread grains purchased by the Administration and resold to bakers licensed to retail "Government" bread in the larger towns. Government grains and bread are sold at controlled prices. The Administration buys from 180,000 to 250,000 tons of wheat, or about 10 per cent of the crop, each year and some barley, the amount depending upon the size of the wheat crop. The balance of the wheat is retained by the growers for their own use or is sold in the free market for use in products sold at uncontrolled prices.

Seven elevators were built just prior to the last war in the following locations:

	Capacity In Tons
Tehran	60,000
Isfahan	16,000
Tabriz	16,000
Ahwaz	32,000
Meshed	16,000
Shiraz	16,000
Kermanshah	16,000
Total	172,000

The elevators at Tehran, Isfahan, and Tabriz are equipped with machinery for handling the grain, but the machinery for the others has not been delivered because of the war and therefore these elevators cannot be used for storage.

The equipment needed for grain handling in these elevators should be purchased and the installations completed as soon as possible. The cost of this work is estimated at Rls. 77,000,000, of which Rls. 36,000,000 are required for foreign exchange. In addition, grain-cleaning machinery should be installed at all elevators not now so equipped. These installations should be of the simple pneumatic type, and should cost about Rls. 6,000,000, of which Rls. 2,700,000 would be required for foreign exchange.

We do not believe that additional capacity is needed at this time. Forty-five per cent of the existing storage capacity has not been used, and we received no reports indicating a lack of storage space. It may be necessary, however, to provide additional storage in the latter part of the Seven Year Plan for the increase in wheat production to be expected when mechanized farming methods are applied to dry farming areas such as the Gurgan Plain and the Hamadan-Kermanshah district.

Inasmuch as the law implementing the Seven Year Plan allocates no funds for grain elevators and considering the relationships of their operation to the control of prices and distribution of wheat and bread by the Ministry of Finance, we have assumed that the cost of the recommended work should be borne by the Ministry of Finance and not be provided for by any allocation of Plan funds.

CHEMICAL INDUSTRIES

The present consumption of industrial chemicals in Iran is concentrated largely at the Abadan refinery of the Anglo-Iranian Oil Company. Tehran consumption ranks next with a few hundred tons of miscellaneous products; the other cities and towns use negligible amounts. Due to the heavy inland freight charges on imported chemicals, several small plants have been constructed over the past 15 years in the Tehran District. They are now mostly in a run-down condition largely due to the almost complete lack of maintenance during the war and, with the heavy overhead imposed by Governmental administration under which nearly all of them operate, the costs of production are excessively high. In short, the inefficient operation of the plants has defeated to a considerable extent the original effort to be independent of imported chemicals. Still more disappointing is the fact that most of the plants are run at a financial loss. Since product quality is invariably well below foreign standards, competition from imported equivalents is severe. As the plants have deteriorated, output and quality have fallen off and, in some cases, consumers are reluctant to use domestic products except in emergency.

The resuscitation of the chemical industry and its preparation for the demands which can be expected in the future will involve some difficult problems. Because of the small consumption, it will be unsound in most cases to build new plants exclusively for domestic use since the low levels of production would not permit construction of economically sound units. We believe, however, that every effort should be made to repair and fully utilize existing productive facilities, and to improve product quality. Wherever suitable raw materials occur in accessible localities, the possibilities of manufacturing chemicals for world markets should be carefully considered even if the products are not needed domestically.

The following problems should receive first consideration:

1. The maximum utilization of existing productive facilities which are still capable, with proper rehabilitation, of producing urgently wanted chemicals of acceptable quality, particularly for the domestic market.
2. The advisability of scrapping any equipment which is obsolete both in type and intrinsic usefulness; for example, the Le Blanc soda ash unit.
3. The study of the raw material situation in relation to future choice of the most suitable sites for erection of the chemical plants envisaged for the later phases of the Seven Year Plan.
4. The advisability of erecting productive facilities for caustic soda and bleaching powder for consumption in Iran.
5. The advisability of building a plant at Agha Jari to produce synthetic ammonium sulphate from natural gas and gypsum primarily for export. It is possible that further research may establish that this fertilizer is needed for domestic agricultural use.
6. The possibility of producing carbon black from natural gas, primarily for export.

Our study included inspection of the existing chemical plants and a review of the future chemical requirements of the country; we studied also the availability of chemical raw materials and means of their practical utilization in the interests of Iranian economy within the limitations of the indicated financial assistance from the Seven Year Plan. Our comments and conclusions are given under the headings of the more important chemicals considered and the allocation of funds is shown in Exhibit K-4.

SULPHURIC ACID

Apart from the production and use of sulphuric acid by AIOC at Abadan, the present domestic demand is little more than three tons per day. Its use is not increasing rapidly and probably will not exceed four tons per day in the coming year. It could be used in fertilizer production, but it would be better to make ammonium sulphate from gypsum; and superphosphate production, which we do not recommend for the present, would have its own sulphuric acid unit, probably located on the Persian Gulf. Half of the present total consumption of sulphuric acid is accounted for in the nitration operations at the Government explosive plant at Parcheene, where the only sulphuric acid plant is located. This plant consists of two units, a contact unit with a designed capacity of four tons per day and an old Peterson unit. The contact unit is in need of repairs and cannot produce to capacity, and the Peterson is not operable.

We recommend that the contact unit be repaired during the year 1328 and certain pumps and spare parts purchased so that it can efficiently produce four tons per day. Approximately Rls. 1,250,000 have been allocated for this work, including Rls. 812,000 for foreign exchange. The Peterson unit is i such bad condition that the expenditure for repairing the tower and other damaged parts cannot be justified at this time.

We understand that private capital is presently interested in erecting a small sulphuric acid unit near Tehran. Should this become a successful project, we would advise the scrapping of the Peterson unit at Parcheene. The present selling price of sulphuric acid is high, and, if it can be reduced, consumption will undoubtedly increase and private enterprise will then be interested in building any new facilities required.

NITRIC ACID

The only production of nitric acid is carried out in a small unit at the Government explosive factory at Parcheene where a yield of about one-half ton a day is about sufficient for cellulose nitration for the present explosives program. All production is devoted to the needs of the Government plant with the exception of negligible quantities delivered to small outside users. An oxidation unit could be installed as soon as synthetic ammonia is manufactured in Iran, but in the interim we recommend that an extension be made to the Parcheene nitric acid unit to increase production by 50 per cent. At present there are four small furnaces for reacting sodium nitrate with sulphuric acid, and we recommend that two additional units be installed during the year 1328, together with necessary absorbing towers, earthenware pipe fittings and receivers. On the basis of rough estimates we have allocated Rls. 1,500,000, including Rls. 325,000 for foreign exchange. When these additions have been made, the plant should be able to make around 200 tons of acid per year.

The cost of manufacturing nitric acid at Parcheene is very high. The sodium nitrate used is obtained at high cost by primitive methods from the neighborhood of Ghum.

With high cost sulphuric acid and low yields from the furnaces, the resulting nitric acid may cost as much as Rls. 100 per kg. It is only because of the increasing need for the product for commercial explosives that we recommend that the plant be maintained and enlarged. The demand for dynamite is likely to increase very rapidly as new road construction and mining programs go into operation. The Parcheene factory uses at present about 150 tons of ammonium nitrate per annum for the manufacture of dynamite, all of which has to be imported. As soon as synthetic ammonia is produced, a small oxidation plant should be installed and the present plant scrapped.

CHEMICAL FERTILIZERS

There seems to be little doubt in the minds of most of the Iranians with whom we have discussed the matter that large quantities of artificial fertilizers are essential to insure self-sufficient food production for the country, and that the erection of local productive facilities to utilize the abundant raw materials suitable for production of ammonium sulphate is an urgent necessity. The general impression is given that the soils are all lacking in nitrogen, phosphorus, and potash. Unfortunately, no agricultural research data have been collected to substantiate this viewpoint. It is imperative that data be gathered at an early date on the chemistry of the soils and that practical tests be conducted to determine whether worth while increases in crop yields can be secured by the addition of fertilizers to the soil.

It is customary in Iran, particularly for such important crops as wheat, to rely on fallowing for soil restoration, and the availability of adequate arable acreage makes this feasible. Statistics show that in 1327 (1948) land utilization was approximately as follows:

4 million hectares under cultivation
12 million hectares of cropland in fallow
33 million hectares of wasteland which is potentially cultivatable.

Thus, only about eight per cent of the potentially cultivatable land is in use at one time and another 24 per cent is in immediate reserve and recovering to some extent the nutrient material lost during its productive period. Intensive cultivation would therefore not seem to be an urgent need.

Nor does it appear that undue leaching of soil occurs, since rainfall in most parts of the country is low and consequently there is no excessive elimination of plant nutrient material. A possible exception might be the rice paddy fields.

We believe that an experimental program of from two to three years should be conducted as recommended in the agricultural section of this report (Vol. III). From field tests made in various parts of the country, data may be derived which will allow a determination of whether a fertilizer plant for domestic needs is justified and, if so, of the types and quantities of fertilizer needed. For this purpose, we have allocated Rls. 300,000.

Nitrogenous Fertilizers

While there seems to be little proven need for fertilizers for domestic use, there are apparently excellent prospects for profitable manufacture of nitrogenous fertilizers for the export market. It is generally believed that a world deficiency of nitrogenous fertilizer will exist for many years, particularly in the Near East and Far East. World

production has increased, but with increased populations, agricultural progress in the less developed countries, and a greater application of scientific agriculture everywhere, a further increase in the world use of fertilizers may be expected. Low-cost producers in the Near East should have a decided advantage in competition with those in countries whose currencies are in world demand. We understand that serious consideration has been given to utilizing the plentiful supplies of natural gas in Saudi Arabia for the production of fertilizer, but no decision seems to have been reached. Before undertaking such a project in Iran, a careful survey of market demand, particularly in Near East and Far East countries, should be made. The following discussion is based upon the assumption that the results of such a survey would be favorable.

We visited Abadan and the oil fields in order to investigate the possibility of securing a suitable location for the construction of a plant for the manufacture of nitrogenous fertilizers for export. Our studies lead us to the conclusion that Agha Jari, in the Khuzistan oil fields, would be most suitable, for it has an abundance of natural gas which is now going to waste, and also almost unlimited deposits of gypsum, from which ammonium sulphate can be made.

We are informed that analysis of gases produced from multi-stage stabilization of Agha Jari natural gas probably would be as follows:

	Percentage by Volume
Hydrogen sulphide	0.29
Carbon dioxide	3.15
Methane	77.16
Ethane	10.7
Propane	5.3
Isobutane	0.8
Normal butane	1.3
Pentanes	0.9
Heavier than C_5	0.4
	100.0

The hydrogen sulphide content of Agha Jari gas is much lower than that from other Iranian fields, and sulphur recovery would be unnecessary. The content of hydrocarbons heavier than ethane does not seem high enough to create difficulties in processing.

We recommend that, subject to favorable results of economic and raw-material studies, a plant be constructed with a capacity of 100 tons of ammonium sulphate per day, equivalent to 27.5 tons of ammonia. About 200 persons would be required for the operation of this plant, together with a supervisory staff of about 15. The plant would take about three years to build and would involve a total expenditure of approximately Rls. 199,800,000, of which Rls. 130,000,000 would be needed for foreign exchange. We estimate roughly that such a plant could be doubled in capacity for an additional expenditure of Rls. 125,000,000, of which Rls. 97,500,000 would be needed for foreign exchange.

It is possible that natural gas will be found in or near the central part of Iran. If this occurs and if domestic needs for nitrogenous fertilizer develop, attention might be given to the erection of a small plant in that locality.

We are informed that, apart from spasmodic occurrence of natural nitrates in the Ghum district, deposits of what may prove to be nitrogenous or phosphatic guano exist

in the central plateau. We suggest, therefore, that during the course of future geological surveys attention be paid to this possibility.

Phosphatic Fertilizers

At the Government plant at Karaj there are two experimental units, each capable of making about one ton per day of 15 per cent superphosphate. Production is intermittent, due to lack of demand, having been only 100 tons in 1327. One-half of this is produced from bones and the remainder from phosphatic rock brought from Hormuz. The cost of making 15 per cent superphosphate from bones is said to be about Rls. 6 per kilogram, which is approximately the price of imported treble superphosphate. The relatively small requirements can be satisfied for the time being by importation of superphosphate, preferably treble superphosphate.

The only naturally occurring phosphatic material brought to our attention, apart from the guano possibilities, is at Hormuz, but it has yet to be determined whether these apatite deposits are commercially workable and suitable for superphosphate manufacture. We recommend that a study be made along these lines. We do not advise the erection of superphosphate manufacturing facilities at this time, as it will take two or three years to evaluate Iran's future domestic requirements, and the building of a plant would not be a lengthy or very expensive operation. Such a plant might be built on the Persian Gulf, say at Khorram-shahr, to which shipments of phosphatic rock from Hormuz or North Africa could be made cheaply and where sulphuric acid of low cost could be made. It might be advisable to make treble superphosphate to reduce distribution costs throughout Iran.

Potash Fertilizers

The use of potash fertilizers may be found advisable or essential to the agricultural development program. We understand that an investigation of the composition and fractional crystallization of the saline brine at various levels in Lake Urmia has been started in the hope of finding a commercial source of potash for fertilizer application. Possibilities at Mianeh, Sanandaj, Hamadan and Takestan should also be investigated.

SOAP MANUFACTURE

Present annual production is about 10,000 tons of laundry soap and 1,000 tons of toilet soap. No laundry soap is imported, although the domestic supply does not adequately meet a rather rapidly growing need. High prices tend to keep consumption low. There does not appear to be any shortage of toilet soap, about 200 tons of which are imported. A Government plant in Tehran makes about half of the total toilet soap used, but the price is only slightly lower than that of the imported varieties, which are quite popular. The plant also makes about 20 per cent of the laundry soap, another 20 per cent is produced in some 15 medium-sized plants, and the remainder is made throughout the country in a large number of small units.

There is a shortage of fats and oils, particularly of tallow, and an unsound practice of exporting certain varieties aggravates the situation. It is probable that availability of such raw materials will improve, but steps must be taken to increase the supply of

caustic soda. Increased soap production and lower cost to consumers will be an important factor in the Iranian public health program. The Government plant at Tehran is modern, but it has not been completed, and its capacity is only about 40 per cent of that originally projected. We believe that this plant should be extended to its originally planned capacity as the quickest and most efficient means of meeting the country's requirements. Special pumps, soap-molding presses, a cooling press, laboratory equipment, condensers and sheet lead are required. We recommend that funds amounting to about Rls. 22,000,000 be allocated for the completion of this plant, including Rls. 17,875,000 for foreign exchange.

INSECTICIDES

Activity in this field has been centered at the Government plant at Karaj, although nicotine sulphate requirements have been taken care of at a well-run extraction plant at the Tobacco Monopoly Bureau in Tehran. The Karaj plant has concentrated on arsenic compounds. Deposits of the sulphides of arsenic are available at Tekab, from which white arsenic, sodium and calcium arsenates, and Paris green have been made at Karaj. The importance of arsenic derivatives as insecticides appears to have been somewhat overstressed and, as a result, establishment of other more suitable and more effective specifics has been slow. We realize that all the modern insecticidal products have to be imported, and we recognize the difficulty in the past, particularly during the war, of keeping abreast of new developments in this field. It is thus understandable that prominence was given to indigenous products. Despite the excellent pioneering work at Karaj, we feel that much will have to be done in the insecticide field whereby more effective results can be obtained with less plant damage. We believe, for example, that little attention has been paid to chemical protection against cotton and citrus pests. More attention should be paid to hydrocarbon sprays and formulations with insecticide DDT and gammexane, both with and without emulsifiers.

We recommend that the insecticide activities at Karaj be revised and broadened in co-ordination with our suggested agricultural research program. The close proximity of the College of Agriculture and of the proposed Agricultural Research Institute would facilitate this work.

It is believed that the climatic conditions in certain parts of central Iran, such as Isfahan or Karaj, would be suitable for the cultivation of pyrethrum, and experimental planting should be started. In the event of success, extraction plants could be installed and highly effective insecticidal preparations could be manufactured, reducing the quantities of imports required for the control of insect pests and malaria.

A base oil is required for the formulation of insecticidal sprays for plant pests. Iranian crudes have been generally regarded as unsuitable for the manufacture of this product and it has been necessary to import oil at high cost. It would be very desirable to lower the cost and we believe that it is of great importance to investigate the possibility of using Iranian crudes in the light of the most recent technological developments.

For the investigations discussed in the foregoing paragraphs, we have allocated Rls. 600,000.

SODA ASH

Assuming that there will be no change in the local production of soda ash, the 1329 requirements would possibly be obtained and utilized as follows:

For making cheap dark bottle glass, for water softening, textiles, etc. This could come from the low-grade Amin-abad production	700 tons
Imported for making glassware	700 tons
Imported for sheet glass	1,750 tons
Total	3,150 tons

This amount, which corresponds to about 10 tons per day, allows for increase in consumption of five tons per day when the Tehran sheet glass unit now under construction commences operations. The present consumption of soda ash is actually not much above five tons a day. Consumption should increase yearly during the course of the Seven Year Plan with the expected expansion of industrial activity, particularly for textile operations, water softening, etc. It is reasonable to suppose that, by 1335, consumption may be as much as 20 tons a day. Since soda ash is a possible source of caustic soda, consumption of the latter must be taken into consideration. Only about three tons per day are now used and it is improbable that 1335 needs will exceed 20 tons per day. This, of course, does not include the Anglo-Iranian Oil Company's importation of around 10,000 tons of caustic soda per annum.

The 1329 demand for 10 tons of soda ash and a few tons of caustic soda per day alone would not justify the building of a Solvay plant. The quantities are too small for economical operation and the requisite initial capital expense would be too high. It is important, however, that a good grade of domestically-produced soda ash be made available to the glassware factories, as the cost of imported soda ash, with the duty and tax, makes it almost impossible for them to compete with the imported glass products which are flooding the bazaars. The quality of the output of the Amin-abad plant is unfit for this purpose.

A brick and concrete building was constructed at Hasht-Gerd some eight years ago to house a 50-ton-a-day Solvay plant which, although ordered, was not delivered because of the war. We do not believe that construction of this plant was justified at the time, as domestic consumption was negligible. It was obvious that the promoters were counting heavily upon furnishing the needs of AIOC in the form of caustic soda and on a very heavy increase in domestic consumption, which has not occurred. Freight charges from the proposed site at Hasht-Gerd to AIOC at Abadan or to ports are very high. The location does not appear to be entirely satisfactory, since the raw materials, salt, limestone, and coal would have to come from mines 6 to 60 kilometers distant. High purity of the salt used is very helpful to the processing, but, while the deposit at Hasht-Gerd appears good, it is probable that equally good deposits in more accessible locations may be found, should it become advisable in the future to erect a Solvay plant not too far from the north central part of the country. We believe that the only justifiable site for a Solvay plant at this time would be at a Persian Gulf port where a substantial yearly production might be disposed of as follows:

1. 10,000 tons of causticized soda ash to AIOC
2. Small quantities of soda ash and caustic soda to satisfy domestic demands
3. Export.

We do not think that the building of such a plant should be a project of the Seven Year Plan.

With respect to the LeBlanc soda ash plant at Amin-abad, we believe that, apart from any plans for the erection of a Solvay unit, earnest effort should be made, without delay, to improve the plant so that products of suitable quality for glass making can be made and the output increased to meet current needs. Specifically, we think that consideration should be given to the use of a method of roasting the raw material whereby greater control and elimination of impurities could be effected. The practicability of extracting sodium carbonate from the leachings in crystalline form should be investigated. Improved methods of mining sodium sulphate at Chamburak should be instituted, and the adequacy of available reserves should be determined. We have allocated Rls. 500,000 for investigation to be commenced immediately. Assuming such investigation gives encouraging results, we would recommend the building of a modified Le Blanc unit, possibly on the present site at Amin-abad, and we have allocated Rls. 6,300,000 for this purpose, of which Rls. 3,250,000 would be required for foreign exchange.

CAUSTIC SODA

Apart from the quantity used by the AIOC, the present yearly consumption of caustic soda is about 300 tons. The local Amin-abad factory turns out about 130 tons in an impure solution which is used by the Government soap factory. The balance is imported. Were it not for the high cost of the imported product, consumption no doubt would be much greater, possibly as much as 700 tons yearly, and it is to be expected that its use, particularly for soap-making, will increase. By 1330, the demand may well be as high as seven tons per day, of which two tons might be used for soap-making, two tons for paper-making, 1.5 tons for textiles, and 1.5 tons for miscellaneous industries.

The demand for caustic soda for paper-making will possibly begin about the middle of 1329, when it is expected that the Iranian Paper Mills at Veramin will begin operations. The paper company, however, proposes to produce its requirements of caustic soda and chlorine in an electrolytic plant and therefore it will be necessary to provide for a remaining demand of five tons per day by 1330.

Since the Iranian Paper Mills plans to maintain on its staff an experienced foreign chemical technologist to control yields and purity, we suggest that consideration be given to consolidating caustic soda production at one plant with a capacity of seven tons per day and that, if necessary, the Plan Organization assist financially in its construction. Assuming such assistance is necessary, we have allocated Rls. 12,750,000 of which Rls. 8,938,000 would be required for foreign exchange.

Such a plant would produce about four tons of chlorine and over 40,000 cubic feet of hydrogen gas per day, enough to supply the domestic requirements of chlorine, bleaching powder and hydrochloric acid for some time to come. Hydrogen not used for hydrochloric acid could be utilized for hydrogenation of fatty oils for production of valuable cooking fats and edible products. The need for such a unit deserves attention. Veramin would be a desirable location for this plant, as it is an important center of vegetable oil extraction and refining.

OTHER PROJECTS

We discuss below certain possibilities of chemical manufacture for which it has not been practicable to make definite plans. Where indicated, the industries should be investigated and plans executed according to the results of the studies. We have allocated for these miscellaneous projects Rls. 5,000,000, of which Rls. 3,250,000 are allocated for foreign exchange.

Hydrochloric Acid

Apart from two units in the Abadan refinery, which produce the requirements of AIOC, the only plant manufacturing hydrochloric acid is situated a few miles from Tehran. Although its capacity is 500 tons per year, the plant is now producing only 120 tons, which apparently represents the present total domestic demand. The purity of the product is not high. Despite the high selling price, Rls. 23.6 per kg, the operation is not profitable due to the low level of production. There are two furnaces at the plant, only one of which is in use. The charging material, sodium bisulphate, comes from the nitric acid unit at the Parcheene explosive factory.

Domestic demand presumably would grow if the acid were cheaper. We suggest that if and when the electrolytic plant is erected, either by the Iranian Paper Mills or others, hydrochloric acid be made there by the synthetic method. The present plant should then be scrapped. Reference to the discussion of caustic soda in this section will show that provision has been made for this, although the size of the hydrochloric acid plant is not indicated. We believe that an initial capacity of one ton per day would be enough. This production could be increased later to keep pace with a gradually growing demand which may be expected as soon as acid of good quality can be offered to consumers at a reasonable price.

Bleaching Powder and Chlorine

We understand that AIOC currently imports about 4,000 tons of 35 per cent bleaching power for petroleum refining and, although the amount is likely to diminish rather than increase, a considerable demand will probably continue. As has been stated, the establishment of a 5-ton-per-day electrolytic caustic soda unit would make available about four tons of chlorine per day. Some of this could be utilized for hydrochloric acid manufacture, but a larger amount could be used for the production of bleaching powder for AIOC's requirements at Abadan and to supply increasing needs of the textile industry.

Water purification is now carried out only to a limited extent, but it is expected that the demand for bleaching powder or chlorine will increase very rapidly when new sanitation and housing schemes are put into operation.

Plastics

In our opinion, the present stage of industrial development in Iran does not justify a substantial plastics industry, but there should be possibilities for small, simple molding operations using imported powders of the bakelite, urea formaldehyde, and polystyrene varieties.

The Government plant at Parcheene has facilities for the production of a low nitrated form of cellulose containing around 11 per cent nitrogen. This would produce celluloid in combination with camphor as a plasticizer. Since this could be made with

indigenous materials and since technical skill is available at the plant, it might constitute a suitable product with which to initiate a plastics industry. From it could be fabricated such articles as combs and toys, using comparatively simple presses which might be made in the Government munitions plants.

Synthetic Detergents

In spite of the shortage of laundry soap and the hardness of the water in many localities, the cost of imported synthetic detergents is at present too high to permit their use by textile manufacturers. If the local soap supply and price conditions do not improve, however, there may be some demand at a later date for synthetics, particularly in specialized textile operations such as wetting-out and dye-assisting under adverse conditions. While the problem is not urgent, consideration should be given to means of producing synthetic detergents in the future.

Nitrocellulose Lacquers

The Parcheene plant has the facilities and skilled personnel to produce a nitrocellulose, with about 12 per cent of nitrogen, which could form the base for lacquers. Indigenous castor oil could be used as a plasticizer, and the obtaining of the necessary gums should present no great difficulty. Clear or colored lacquers might be produced for leather finishing. We understand that practically none of these materials is now generally used, except for a small quantity in the Tabriz factories, because the costs of the imported products are too high. An annual demand for, say, 10,000 gallons might well be found for leather, furniture, metal, interior decoration, and automotive sprays. The aliphatic solvents would have to be imported, but the price of the finished sprays to the consumer might be made attractive enough so that a substantial demand would be created.

Glass Industry

At the present time the glassware industry appears to be at the mercy of the imported finished products of which there is a substantial inventory in the bazaars. One moderately large and about 20 small glass plants are located in Tehran, and about 10 elsewhere. All but two or three of these are said to have closed down due to foreign competition. Except for cheap glass bottles, local cost of production is high because domestic soda ash of good quality is not available. The duty on imported soda ash is Rls. 3 per kg, whereas that on imported glassware is only Rls. 0.5 per kg. There is no import quota. The total glassware consumption, other than sheet glass, is valued at around Rls. 50,000,000 annually, about half of which is imported. About Rls. 10,000,000 worth of glassware is said to be exported per year.

A new sheet glass plant is nearing completion at Tehran. This should be able to take care of domestic requirements, all of which are at present imported and are valued at about Rls. 50,000,000. It is planned to export around Rls. 20,000,000 worth of sheet glass.

The glassware factories are almost entirely manually operated. Arrangements should be made to install automatic bottle-making machinery in at least one of the plants, possibly at the Tehran plant where melting tank capacity is adequate.

Glass making is an important basic industry of Iran and in our opinion its full usefulness for containers has not as yet been developed. A good quality product at a reason-

able price is necessary and in order to obtain this two conditions are required: mechanization of the industry and good quality soda ash. While we have not made specific recommendations for the expansion of this industry under the Seven Year Plan program we believe that the Plan Organization should be alert to the development of opportunities of encouraging private capital in this field.

Dyestuffs

Compared with its low consumption of chemicals generally, Iran uses a very large quantity of imported dyestuffs in the carpet and textile industries. Individual dyeing operations are on a small scale, but the users of the dyes, always prejudiced by their former experiences, employ a large variety of imported dyes. The postwar market, which has become highly competitive, is now almost entirely in the hands of the Swiss, who have replaced the German producers. The market is complicated and the Government import control formalities do not improve the situation. There is no possibility for domestic production of any of these synthetic colors.

Pigments and Paints

There are some paint pigments readily available. Good quality red oxide of iron occurs at Hormuz and barytes at Veramin and Karaj. Chrome green could be made from sulphur and chromate which is presently produced from good quality chromite ore. Linseed oil output might be increased from the present yearly production of around 300 tons, and almost unlimited quantities of paint thinner can be made readily available. There are several small concerns engaged in mixing imported paints and pigments, but no company produces good quality paints or paint products from local materials. This possibility should be investigated.

Glycerine

The Government soap plant at Tehran until recently has been producing about 18 tons of glycerine per annum, an amount which is less than its designed capacity, but sufficient to satisfy the present requirements for explosives and other products. The equipment is in bad condition and unless rehabilitated may become inoperative. Rehabilitation of existing equipment, together with the added facilities recommended in the foregoing paragraph would probably increase the capacity of the plant up to about 180 tons annually. A substantial part of this will be needed for the increased demand for dynamite.

Hydrogenated Oils

In the event of the establishment of an electrolytic caustic soda plant in Iran, as has been recommended, hydrogen gas will be available for the production of edible oils, margarine, and cooking fats from locally-produced vegetable oils such as cottonseed oil. Hydrogenation of cottonseed oil would produce a suitable base material for use in the Government soap plant at Tehran. Fish oils may also be treated to relieve the general fatty oil shortage.

Liver and Glandular Extracts

We recommend that production of the above should be carried out on a commercial scale after the necesary experimental work has been done. The Institute Hessarek near Karaj would be the most suitable location because of the experience of the staff there, the

available experimental facilities, and the room for such expansion as may be needed. High-quality, closely-cut light petroleum ether fractions, ethyl ether, and ethyl alcohol are produced in Iran, and it is probable that no solvents would have to be imported for the extraction operations.

Carbon Black

With the abundance of natural gas in the Khuzistan area, carbon black manufacture would appear to offer profitable opportunities provided suitable export markets can be found. Domestic use would, of course, be of negligible importance. Without making a detailed study, we are inclined to believe that a plant of smaller capacity than 25 tons of channel black per day should not be considered. We believe that Agha Jari would be a suitable site, as available gas there should easily provide the 20,000,000 cubic feet per day needed for such a plant, and the indicated analysis of the gas, given elsewhere in this report, suggests its suitability for the purpose. Annual gross proceeds from the production at present prices would be about Rls. 32,500,000. Production costs should be low. We estimate roughly the cost of such a plant at Rls. 100,000,000 which would include Rls. 65,000,000 for foreign exchange.

Apart from Russian production, the world's channel black requirements are manufactured in the United States, and present production appears adequate for the demand. New production outside the United States would thus have to be sold to consumers presently being supplied from that country. A market might be found, however, among consumers in countries where dollar payments are at present difficult. Indeed, some increase in the use of channel black might even be effected if dollar payments were not demanded. Moreover, furnace blacks, which are now strong competitors with channel blacks, might be replaced to some extent. It would be necessary to investigate this matter very closely before making definite recommendations for the erection of a plant in Iran, but we think that such investigation should be made.

MINING

A large part of Iran is composed of sedimentary rocks favorable for coal and oil. Iron ores are sometimes associated with sedimentaries. Contacts with igneous rock intrusions are favorable for deposits of metallic minerals, especially lead, zinc, and copper.

Relatively little, however, is known of the geology of the country. It has never been systematically surveyed and no reliable information of the full extent and quality of deposits is available, even for those now being worked. From general indications, it would seem that Iran is not highly mineralized, except for the petroleum possibilities.

Mining operations as a general rule require relatively large investment of capital. For a successful mining venture, therefore, it is necessary that a demand exist for the products either at home or abroad, that the products can be transported to markets at reasonable cost, and that the nature, quality, and extent of the deposit are such as to make possible economical operation. In this connection, however, it should be borne in mind that, in order to give employment and save foreign exchange, it may well be more advantageous to produce minerals in Iran at a cost somewhat higher than the prices at which they can be imported.

The principal mineral deposits now being exploited, exclusive of petroleum which is treated elsewhere in this report (Vol. IV), are coal, iron, copper, lead, sulphur, and salt, but even the largest of these operations must be considered relatively small.

During our study, we visited about 20 of the more important mines. We were given every assistance by officials of the Government agencies in charge. Our representative had the advantage of having made a previous study of some of the mines.

In the following pages are set forth brief details of the mines inspected and the methods by which they are worked. Inasmuch as none of them are well equipped or efficiently operated, the general remarks may be taken as applicable to practically all of them.

Very little work has been done to determine the quality and extent of deposits and whether they are economically workable. Accurate, up-to-date maps showing work already done, the work in progress, and assays or analyses of ore, are lacking. Such maps are essential to efficient operations.

In many cases the mechanical equipment used is primitive; even the hand tools used by miners are of poor quality. Grading of mine tracks is uneven and often too steep, and trackage is poorly laid. Underground haulage is unnecessarily expensive.

Mine timbering, as practiced, is expensive and inefficient. The timbers used are often too small and the sets are too closely spaced. In some cases we found that from four to six times as much timber is used as should be necessary. This not only adds to the cost, but also results in a wastage of timber. At some mines the accident rate is high. Many minor accidents and some serious ones could be prevented by the use of safety helmets and steel-toed shoes.

All the mines visited were overstaffed and overmanned. Production per worker is extremely low. It was obvious in almost all cases that, by more efficient methods and the installation of a moderate amount of relatively simple equipment, increased output at lower cost could be effected.

As a result of all of the foregoing deficiencies, production costs are high and few of the mines are profitable. In some of the discussion which follows, prices and costs are mentioned. It should be borne in mind that the costs shown probably do not include adequate, if any, charges for depreciation of equipment or depletion of the deposits.

COAL MINES

Shemshak Mine

This mine is located about 64 kilometers northeast of Tehran to which coal is transported by truck. The mine office, powerhouse, coal screens, machine shop, bee-hive coke ovens, and some washing equipment, are located near the original tunnel portal, which is no longer used but which, we understand, may be reopened. The present main portal is located about one kilometer from the mine office and is reached by a steep trail passable only by pack mules or on foot.

Three seams are presently being worked. The coal from one of them is of coking quality, and that from a second seam is said to be of coking quality if washed. The seams vary in strike and dip, and in width from 20 to 40 centimeters.

Coal is transported from the main workings to the truck-loading dumps at the mine office level by about 300 pack mules in 100 kilogram loads.

Haulage within the mine is by Decauville cars of 700 and 500 kilogram capacity, drawn by diesel locomotives. The trackage is irregular and often steep.

Mining methods are safe and ventilation is excellent.

The average daily production from the main seam is 30 tons and is about the same combined amount from the others. The mine organization consists of 24 salaried personnel, 18 clerks, 113 men on the surface, and 375 men underground. The output per employee is .113 tons per day, whereas in the United States the output per man per day is in excess of five tons.

In 1327 the average cost per ton was Rls. 1,239. The selling price of lump coal, which represented 10 per cent of the production, was Rls. 720 per ton, and of fines Rls. 670 per ton.

Zirab and Dililum Mines

The mine offices for these mines are located about 4.8 kilometers from the village and railroad station of Zirab, which is 219 kilometers northeast of Tehran. Coal is carried by aerial tramway from the main workings at the 592-meter level to the railroad siding, but the present producing level is at elevation 736 meters from where coal is transferred through covered chutes and by trucks to the tramway.

There are five seams varying in width from 20 to 70 centimeters. The seams, the dips of which vary between 35 and 60 degrees, are stoped by the cut-and-fill method. Surface indications are that the seams extend for at least five kilometers. One seam has been proven by pits to extend seven kilometers. The mine is well ventilated, and the mining methods are safe.

The haulage ways are poorly laid and maintained, and two men are needed to move a car which one man could easily operate on a well-maintained track.

The output of this mine in 1327 was 38,000 tons, a daily average of about 127 tons based on 300 days' operation per year. This was produced by 928 employees, an average of 0.137 tons per capita per day. The output is sold principally to the textile mills at Behshahr and Shahi and the cement plant at Tehran. Lump coal, which comprises about six per cent of the total, sells at the mine for Rls. 870 per ton and run-of-mine coal at Rls. 670. The average cost in 1327 was reported at about Rls. 592 per ton.

The small mine at Dililum, located about 11 kilometers from Zirab, produces about 20 tons per day. It is operated by the Zirab management and its output is included in the Zirab figures.

Golanderud Coal Mine

This mine is situated 84 kilometers southwest of the Caspian seaside resort of Babulsar. Only four of the five seams are being worked because there is no market at present for the coking coal found in the fifth seam. This is the only coal mine thus far developed in Iran in which the problem of gas is serious. Some months ago an explosion occurred, injuring several men.

The output in 1327 is reported at 12,144 tons and employment at 207 men. The average daily output per man on the basis of 300 days' operation would thus be about 0.195 tons. Half of the coal produced is lump and half fines. With the exception of some experimental orders for fines from the Shahi jute mill, a market has been found only for the lump coal. The mining cost is estimated at Rls. 535 per ton, but since only half the output is salable the cost should more properly be placed at over Rls. 1,000 per ton.

The principal market for lump coal is the Chalus silk mill which pays Rls. 820 per ton f. o. b. trucks at the mine. The price paid by the Shahi jute mill for fines is Rls. 220 per ton. The cost to the mill, including transportation charges, is Rls. 480, which is considerably less than that paid for fines from the Zirab mine.

The coal reserves are large and can be cheaply mined, but it does not seem that greatly increased production will be possible unless a substantial local demand for coal develops.

Garjareh and Elika Mines

These mines are situated 112 kilometers northwest of Tehran and 78 kilometers from Karaj. The Elika mine has been closed because of high operating cost. At the Garjareh mine there are eight seams, of which five are now being worked. The coal is soft and somewhat gassy, but adaptable for coking. The total output in 1327 was 18,776 tons. The output per man, per day, 0.2 tons, is the highest of any coal mine in Iran, but could be increased substantially by the use of better equipment and methods. The production cost is reported at Rls. 535.5 per ton. Selling prices at the mine are Rls. 750 per ton for lump coal, which represents 25 per cent of the output, Rls. 550 for run-of-mine coal, and Rls. 500 for fines. A loading charge of Rls. 20 per ton is made on all coal. Coke, which is produced in beehive ovens at the mine, is sold to the sugar beet plant at Karaj at a price of Rls. 1,250 per ton.

Other Coal Mines

The Nessar coal mine is located on the main Chalus-Karaj road, 14.4 kilometers from Garjareh. The coal seams are believed to be extensions of the Garjareh seams, but are of lower quality. The mine is under private management and is not presently being worked.

The Abyek mine near Kazvin is closed and the Abr mine, situated 42 kilometers from Shahrud, was about to be closed at the time of our study. A new mine lies one kilometer to the east of the Abr mine.

The Chashmeh-Gol mine is about 30 kilometers north of Turbat-i-Shaikh Jam. There is one seam of coking coal, but it is irregular and reserves have not been estimated. The deposit is useful as a source of coke for the beet sugar plant at Meshed, but its potential importance is relatively great because this coal could be used for producing power for the various industrial enterprises in this area.

The Badamoohieh mine, situated 32 kilometers from Kerman, is privately owned and operated. The Kerman area is so remote from oil and other sources of power that the potentialities of this mine merit careful examination because of the opportunities in the area for the development of industries, such as textile mills, and of the need for power for irrigation pumping and lighting.

The coal is said to have a heat value of only 5,000 calories per kilogram and is soft and friable, but it may become harder with greater depth. Simple sluices for washing might raise its calorific value. We understand a Government geologist is currently making an examination of this area and that the Government has indicated its willingness to lend further assistance if necessary. So far the coal has been mined unsystematically and inefficiently at such high cost that there has been no market for it. The quality at present is such that it can be used efficiently only in pulverized form.

New Sources

Exploration should be made for new sources of coal, particularly in the following areas:

Sheshlag-Gurgan
Lar and Demavand
Azarbaijan

Should any of these prove promising, preliminary work such as pitting, trenching, and sampling should be carried out.

IRON MINES

Iron is a basic need of any modern economy. At present no iron is produced in Iran although the ore and all other needed raw materials are available. Much money was spent before the war in developing mines in the Samnan area in anticipation of the construction of a steel mill at Karaj. The mill was not built and no use has yet been made of the ore which has been mined. Large quantities of cast iron pipe and other products will be needed for the development program, and there will always be a need for the many products in the manufacture of which iron is required.

Samnan

The most important occurrence of iron ore at present is in the vicinity of Samnan. There are two ore areas, North Samnan and East Samnan. In the former there are three mines, one of which has been entirely mined out. None are now being operated. The principal ore body, known as No. 3, is of hard magnetite with an average iron content of 67 per cent. It is estimated that there are 240,000 tons of crude ore, including 65,000 tons on the dump. The ore has been mined by open cut and by cross cuts at a 40-meter depth to facilitate ore removal. The ore was stated by the Belgian steel specialist, Mr. DeWulf, to be satisfactory for use in blast furnaces if mixed with other ores.

We were informed that in 1320 (1941), when this mine was last operated, the cost per ton of ore mined was only Rls. 14, a very favorable rate even at the then existing purchasing power of the rial.

Mine No. 2 is located about a kilometer from Mine No. 3. The deposit is hematite with a sulphur content of from 1.3 to 1.6 per cent, which would make its use difficult in blast furnace operation except in very small proportions. There are some 50,000 tons of this ore on the dump.

At the No. 1 mine, which is worked out, there are approximately 4,000 tons of ore on the dump.

In eastern Samnan there are seven mines known as:

Sheikab East
Sheikab West No. 1
Sheikab West No. 2
Hamyer No. 1
Hamyer No. 2
Hamyer No. 2B
Hamyer No. 3

The largest working is Sheikab East, located about 74 kilometers east of Samnan. The ore bodies are mostly hematite with an average of about 50 per cent iron content and one occurrence of limonite with an iron content of from 41 to 47 per cent. There are about 122,000 tons of broken ore on the dumps and reserves are estimated at 120,000 tons.

Sheikab West No. 1 mine is about two and one-half kilometers from Sheikab East. The ore is low-grade containing about 40 per cent iron in the picked ore and less in run-of-mine. The use of the ore would thus present a problem of concentration. There are 25,000 tons of ore on the dump and about 10,000 to 15,000 tons in reserves. Sheikab West No. 2 is about a kilometer southwest from No. 1 and the ore is similar. There are 40,000 tons on the dump and reserves are estimated at 666,000 tons.

Hamyer Mine No. 1 is 8.3 kilometers by road east of Sheikab East. The hematite ore is said to contain about 47 per cent of iron. There are about 10,000 tons on the dump and estimated reserves are 300,000 tons. Hamyer Mine No. 2 is located within a kilometer of No. 1. The ore is stated to contain from 45 to 50 per cent iron. There are 5,000 tons on the dump and reserves are estimated at 75,000 tons. Hamyer Mine No. 2B, close to No. 2, is estimated to have about 10,000 tons of the same grade of ore on its dump. Hamyer Mine No. 3 was not visited by us as we were informed no ore had yet been mined. The estimated reserves are 80,000 tons of grades similar to the other Hamyer mines.

We do not believe that further work on these mines would be justifiable pending the result of a study which we recommend to determine the advisability of establishing a blast furnace in the area.

Hormuz Mine

There is a large deposit of red oxide of iron on this island, which is located in the Persian Gulf. All of the ore is exported. Because of its purity and color, it is used largely as a pigment in paints. It is also used as a catalyst in the manufacture of sulphuric acid. The mine consists of a main working and a newly-reopened working about one-half kilometer distant. Some prospecting for further development is being done. The red oxide is carried by donkey 14.6 kilometers over a poor road to the coast where it is loaded into small lighters or dhows for transport to the stockpile. Subsequently the material is reloaded into lighters or dhows for transfer to cargo ships which must lie at anchor a kilometer or more off shore. This operation is inefficient and expensive and steamship operators are dissatisfied with the long loading time involved.

Farus Island

This island, located about 19 kilometers southwest of Rasbustaneh, contains six known deposits of hematite, the largest of which is estimated to contain about 780,000 tons with an iron content varying from 38 to 63 per cent. In 1327, analyses of samples,

made by Ledoux & Company, were submitted to the United States Steel Corporation, which discontinued negotiations for exploitation of the deposits because of the relatively high percentage of sulphur and phosphorus in the ore.

COPPER

Domestic requirements for copper far exceed present domestic supplies, so that the search for new copper deposits and the fostering of present mines to a reasonable extent is justifiable. New mining operations, however, should not be undertaken until the extent and quality of deposits are known and the probable cost of production determined.

Damanghal Mine

This mine is located at Abbas-abad on the highway from Tehran to Meshed, about 557 kilometers east of the former city. It is the most important copper mine in Iran.

The smelter and mine, which are adjoining, are 6.4 kilometers to the north of the highway and at an elevation of 57 meters above it.

The smelter consists of a reverberatory oil-fired furnace capable of taking a charge of 25 tons of 7 per cent copper ore and 5 tons of limestone to produce about 2 tons of matte containing 85 per cent copper. Production in 1327 amounted to only 13 tons of copper, largely because in that year the original water-jacketed blast furnace was replaced by the present reverberatory unit. Costs were accordingly very high.

The ore is hand-cobbed and hand-sorted and crushed in a jaw crusher. It is estimated that on the dump there are now segregated lots containing 4,000 tons of 7 per cent ore, 6,000 tons of 2½ per cent ore, and 20,000 tons of 1½ per cent ore, and that about 370,000 tons remain in the ore body. The run-of-mine ore is said to average only one per cent copper.

The mine is an open cut operation about 60 meters wide by 100 meters long. There are traces of many acient workings. The mine is obviously unprofitable, but it should be possible to mine the ore more cheaply than at present and it may be possible to develop an ore treatment method to concentrate the ore on a large scale. Every effort should be made to place this mine on a paying basis.

Maden Buzorg Mine

This operation is located about eight kilometers east of the Damanghal smelter. Apparently a large amount of work has been done in a great open pit. The ore body is a porphyry with large phenochrists up to four centimeters long. There is a slight copper staining, and very few segregations of malachite. Many samples were said to give a maximum of 0.3 per cent copper, and no copper was obtained when the rock was smelted.

We can see no justification for continuing work at this location and recommend that the equipment be removed and stored until other uses can be found for it.

Talmessie Mine

This mine is located 37 kilometers northwest of Anarak in the heart of that highly mineralized district. It has been well equipped and the ore has been thoroughly delimited. The ore is a unique combination of native copper, malachite, and nickel sulphide in a

mineralized porphyry lying between conglomerate walls. There seems to be little extension of the present ore body, but it should last for many years at the present rate of operation. As an exception to most mines in Iran, good general maps are kept. However, there are no assay or stope maps. The ore is said to average one per cent copper and is concentrated by hand cobbing and sorting to ten per cent copper content at which grade it is fed to the smelter. The matte is shipped to Tehran for electrolytic refining.

Apart from the excess of personnel in the office and on the surface workings, this mine appears to be better operated than any of those inspected. Office work is well performed and the general maps are well executed. Stores are unusually neatly kept, and the plant in general is in good condition.

Meskani

This mine is located about ten kilometers south of Talmessie at an elevation of 1,500 meters.

The ore body lies under extensive ancient workings. The ore gangue is said to be porphyry and the walls conglomerate. The ore is composed of copper carbonates with some sulphides. The ore bodies seem to occur in veins widening into pockets. The ore on the 50-meter level is reported as one per cent copper and on the 75-meter level as one and one-half per cent.

The ore is of low grade, but seems to be improving slightly. There are extensive workings along the surface. There is a well-aligned main shaft and the surface equipment is in fair condition.

Bagherogh Mine

This mine is located 48 kilometers east of Anarak. The deposit was discovered by a German engineer about 1314 (1935) and was worked continuously for eleven years, employing about 300 men. An output of ten tons of ore a day is reported to have been achieved. By hand cobbing and hand sorting, four tons of concentrates of eight per cent copper were obtained and smelted per day.

The workings visited and the ore on the dumps showed very light impregnations of copper carbonate.

It was reported that during the last six years of operations the mine did not pay expenses and it does not seem that it can be operated profitably. All equipment should be removed so that the expense of watchmen can be stopped. The hoist, mine cars and track could be put to good use in the development of the Kerman coal deposits.

Other Deposits

Copper mines and prospects are reported at Bayaheh-bagh in the Zenjan district, at Kara-dagh near the Russian frontier, in the Senjedeh district, and in the Bahrasman district. These deposits were not visited by us, but from the information given it would appear advisable that some drilling and testing work be done when practicable.

LEAD

Chahkabuzeh Mine

This privately-operated mine is located 40 kilometers from Anarak. Operation of the mine is said to be profitable. About three tons of lead ore are raised per eight-hour shift. Concentration is done by cobbing, sorting, and panning, using hand methods.

Nakhlak Mine

This mine, also privately operated, lies some 20 kilometers east from Chahkabuzeh. One vein only is being worked, although there are four veins which show indications of ancient workings.

The reported output is 13 tons of ore per day, and between one and two tons of pig lead per day is marketed in Tehran. Operation is said to be profitable.

General

Since lead is a much-needed commodity both for domestic consumption and export trade, it is recommended that all possible encouragement be given to prospecting and to the development of existing mines, including privately owned mines. The following small mines should be investigated with this in view: Bol-Sar in the Resht district; two small mines in the Damghan area; one mine near Yezd; the Afshan mine in Azarbaijan; and prospects in the Seerah district of the Karaj River Valley.

OTHER METALLIC MINERALS

Chromite

Chromite deposits occur near the village of Forumad, 39 kilometers from Abbas-abad and 24 kilometers east of the Damanghal copper mine. The ore is said to occur in 20 lenses, some of which are connected underground. It is estimated that the reserves amount to about 60,000 tons.

About 1,000 tons of chromite, said to run 44 per cent Cr_2O_3, have been mined and are on the dump. A 500-ton shipment was made to Tehran, but no market has been found for it. It is hoped that some of this material can be used by the tanning industry and possibly some use may be found for it in the paint industry.

Chromite also is said to exist in the Minab district on the Persian Gulf. If it can be developed in large quantities of commercial grade, markets may be found in the United States and Europe, as these areas now import chromite from Turkey and Rhodesia. Examination and prospecting therefore are recommended where conditions are favorable. We recommend the allocation of Rls. 32,000, all of which would be for domestic expenditure, to carry out this exploratory work.

Manganese

The Robat Karim mine is located about 64 kilometers from Tehran. There are approximately 4,000 tons of ore on the dump and it is estimated that reserves amount to about 60,000 tons. There is no present domestic use for this mineral and the mine is located so far from seaboard as to make export of the ore unprofitable. It is possible, however, that a use may be found for manganese in the manufacture of cast iron.

Antimony

This mineral is mined at Ferdows about 400 kilometers south of Meshed. There are about 32 tons of low grade ore in storage at Abbas-abad. The cost of transportation is too high for it to be of commercial value for export and no domestic market has been found for it,

Gold

There is a gold placer mine at Kuhzar which is said to have been worked in ancient times. An investigation was recently started to determine the value of this deposit, but scarcity of water prevented conclusive results. If and when water is available, it would be advisable to test this area to bedrock by using an Empire or Banka drill.

A new find of gold is reported near Aastanieh, 40 kilometers south of Arak. The amount of gold is said to run about 200 milligrams per cubic meter. If reliable panning confirms this report, the deposit should be systematically tested by the types of drill mentioned above. The same remark holds good for Dorud, where gold values in the river gravel have been reported.

NON-METALLIC MINERALS

Sulphur

The Delesian mine lies 39 kilometers south of Samnan on the site of ancient workings. The Government has been working this deposit for more than 20 years, but has maintained no maps or records of samples of the output.

The ore is stoped by hand, and no explosives are required. The floor is very uneven, there is no track, as the sulphur is moved in wheelbarrows and buckets. A total of 122 men are employed, of whom only 15 work in the mine itself.

Sulphur of 98.58 per cent purity is obtained by using clay pots as retorts, with brushwood for fuel, oil having proved too expensive. There are 18 subliming ovens, each holding 16 retorts.

It is reported that 825 tons of ore were mined in 1327.

There is an important deposit of sulphur north of Boustaneh near the Persian Gulf. We are informed that a concession has been granted to private interests to operate it for the production of stick sulphur for export to India and other markets.

Salt

A deposit of rock salt was visited on Ghishm Island west of the port of Bandar Abbass. This deposit, called Namakdan, is stated to have been prepared to produce 30,000 tons annually for a period of 60 years under a concession to the Japanese. The reserves are estimated at a minimum of 1,800,000 tons.

Samples taken show a content of 97.49 per cent sodium chloride. This mine could be very cheaply operated by using rooters and bulldozers discharging salt into lighters, which in turn would deliver it to oceangoing vessels. We understand that ships' masters complain of delays in loading ships by the present methods.

There is an important salt deposit on Hormuz Island, but it is mixed with iron ore segregations in so many places that careful examination by pits, stripping, drilling, and sampling would be required before any recommendations can be made concerning its commercial potentialities.

Magnesite

Magnesite has been mined near Peyazi, about 100 kilometers from Meshed. The specimens shown to us seemed to be of excellent quality, but the distance of the mine from industrial centers prevents the deposit from being of commercial value.

Fireclay

Fireclay deposits are now being operated about 20 kilometers southeast of Tehran. Fire bricks made from this material are of good appearance, but it is stated that they do not long withstand high temperatures. It would be advisable to have samples sent to a competent refractory laboratory in the hope that some method might be evolved to produce a brick suitable for high temperatures.

CONCLUSIONS AND RECOMMENDATIONS

Exhibit K-5 shows a summary of all the recommended allocations of Plan funds by periods for mining investigation and development. Exhibit K-6 shows the work which we recommend to be carried out at each of the mines and in connection with the general mining program, together with the estimated expenditures necessary therefor. It should be borne in mind that some of these recommendations, especially those designated for the second year and later, should be carried out only if the results of diamond drilling and other exploratory work are sufficiently favorable to warrant the expenditures therefor. We give below general recommendations concerning the program as a whole.

Several of the mines require geological and topographical surveys, together with diamond drilling and other investigations to determine both the extent and quality of deposits. In some instances, it may be advisable to send samples of ores abroad for analysis and test to determine their usefulness and to evolve economical methods of treatment. In this connection, the Central Laboratory at Tehran should be examined by a competent chemist to make sure that it is properly equipped for work with coal and other minerals and to recommend the obtaining of such equipment as may be required.

In connection with any development program, especially those which contemplate the opening of new mines or increasing the output of existing mines, studies should be made to determine whether the mines can be operated economically and the products either used in Iran or exported profitably.

Practically all mines require rehabilitation of present equipment and the addition of new and improved equipment, including hand tools. It is especially important that operating methods be greatly improved if production is to be increased and unit costs reduced to reasonable levels. Above all it is important that all mines, both Government and privately owned, reduce the number of persons on their payrolls.

It would be most advantageous if arrangements could be made by the Department of Mines and the Ministry of Agriculture so that mine operators, under appropriate restrictions, would be granted permits for cutting their requirements of mine timber; minimum diameter of posts and caps to be cut should be 20 centimeters. To save waste, the cutting of mine timber might be coupled with a small portable saw mill operation.

Foreign specialists will be required for the improvement of mining practices and for training Iranian personnel. About 12 persons would be needed, including at least one chief adviser and mining engineer, one experienced mining accountant, and two each of the following: mine foremen, shift bosses specializing in coal mining, shift bosses specializing in timbering, master mechanics, and diamond drill operators. The chief adviser

might be required for about five years, the accountant for one year, the diamond drill operators for two years, and the others for three years. We suggest that Americans or Canadians be employed because of the wide range of mining conditions in the Western Hemisphere and the consequent broad experience which many American and Canadian specialists have had.

It might also be advisable to send a small group of Iranians who have had practical experience in mining to visit some of the smaller mines in the United States and Canada.

There should be an extensive search for new mineral deposits and the simple methods outlined below could be used with advantage:

1. About 50 sets of samples of the 16 or 20 most useful minerals likely to be found should be prepared. These should be placed in strong boxes divided into sections and provided with a cover with lock. Each sample should be numbered and placed in a compartment of the box, together with a leaflet in Persian describing each specimen and giving the following information with respect to it:
   a. The general nature and kind of rock and environment in which the mineral is most likely to occur.
   b. The useful metal or product which can be derived from each mineral.
   c. The general world price of each product or each metal.
   d. The various ways by which the product may be obtained from the ore, and other pertinent information.
2. These boxes should be provided to, say, six Government mining engineers, each of whom should reside in one of the six general districts into which Iran may be divided from the standpoint of mineral occurrence. One of the duties of these engineers would be to inform land owners, tribal chiefs, shepherds, professional hunters, soldiers, and others about these minerals and the importance to their village or locality and to the country in general if mineral deposits can be discovered and mined. Rewards should be paid to anyone bringing in specimens from new locations, but only after the location in which they are found has been inspected and the fact confirmed that the specimen has been taken from a vein or lode in place.
3. As and when indications of new deposits have been found by these means, geophysical and geological surveys should be undertaken, the extent of which will, of course, be determined by circumstances in each case.

In order to encourage private capital to engage in mining, it would be well to extend the terms of mining concessions to a minimum of about 25 years. In Saudi Arabia and other nearby countries, oil and mining concessions often extend for 60 years.

IRON AND STEEL

As stated elsewhere herein, the iron mines at Samnan were developed in anticipation of the establishment of a steel plant at Karaj. We were advised that prior to the war the Government contracted with German firms to construct a steel plant with a capacity of 300 tons per day. The equipment was to include by-product coke ovens, two blast furnaces, open hearth furnaces and rolling mill equipment. The foundations for the plant, and buildings for administrative and living purposes were largely completed. A part of the equipment was delivered, but delivery of the balance was prevented by the war. This plant was estimated to cost the equivalent of about $16,000,000 and we were advised that approximately $10,000,000 has been expended on the project.

We do not think it would be economically sound to proceed with the construction of this plant at the present time. To produce the various kinds of rolled steel products needed, such as rails, sheets, bars, and structural shapes would require a much larger investment than present demand would justify, as only a small fraction of the capacity of the various mills would be needed and manufacturing cost would be unduly high.

We do believe, however, that it will be found desirable to establish a blast furnace operation with a capacity of from 100 to 150 tons of pig iron per day, and a foundry for making cast iron pipe and miscellaneous castings. As far as possible the existing construction at Karaj should be utilized. There should be a relatively large demand for such products in connection with the installation of water systems, for the railroads, for mines, for machine parts, and for general purposes. Before decision is made to proceed with this project, a detailed study should be made, including the following:

Review of the plans for the plant originally proposed, with a view to using as much of the existing foundations as possible
Inventory of machinery and equipment, if any, still intact at the site or elsewhere in Iran
Suitability and quantity of necessary raw materials
Transportation facilities
Markets
Preliminary layouts
Lists of equipment needed and bill of materials
Estimate of the cost of the plant
Proposed organization and operating program
Estimates of revenues, expenses, and working capital requirements.

This study should be carried out under the direction of competent foreign specialists in blast furnace and foundry design and operation who are not affiliated with any manufacturer of equipment.

If a sufficiently large market should subsequently develop to justify construction of a small steel plant, the blast furnace proposed herein would still be needed and would serve as a useful initial step in this direction.

At this time it is, of course, impossible to estimate accurately the amount of money which should be allocated to this project, but the tentative figures are shown below, the allocation in 1328 being for investigation and the remainder for construction of the plant if the results of the investigation are favorable.

	In Thousands of Rials		
	Domestic	Foreign Exchange	Total
1328-Second Half	80	720	800
1329	5,000	23,000	28,000
Remaining 5½ years	34,000	68,000	102,000
Total	39,080	91,720	130,800

SUMMARY OF ALLOCATIONS

A summary of the allocations by periods for all industry and mining is shown in Exhibit K-7.

ELECTRIC POWER

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L-1 Electric Power Requirements of Principal Cities and Minor Cities

L-2 Estimate of Comparative Costs and Performance for Various Sizes and Types of Generating Units

L-3 Recommended Allocation of Plan Funds for Electric Power

ELECTRIC POWER

INTRODUCTION

Central stations for supply of electric power are involved in the Seven Year Plan and its objectives from two aspects. First, electric power is an essential factor in industrial production, and can usually be supplied from central stations at less cost and with greater reliability than from individual generating plants in each factory; central station power is also a factor in agricultural production to the extent that irrigation pumping may be developed in the vicinity of the central stations. Second, use of electric energy in an increasing variety of applications is an important element in improvement in business efficiency and in raising the standards of living of the people, and it is one of the first items to which increase in income of urban residents will be devoted. An adequate and economical power supply for general urban distribution requires the development of larger and more efficient generating stations.

This section of our report is concerned primarily with the development of a program for central power stations for the principal cities of Iran. It is expected that these central stations, in addition to being the source of supply for general distribution in the cities, will supply the power requirements of most new factories and industrial establishments in or near the cities, and of such irrigation pumping as may be located nearby. Only incidental consideration is given to integral power facilities to be installed in factories in special cases, to power installations for irrigation pumping located beyond reach of electric lines from the central stations, and to power stations for small cities and villages. No consideration is given to power supply for the Anglo-Iranian Oil Company (AIOC) properties or for the cities receiving their power supply therefrom.

PRESENT POWER SITUATION

Use of electric energy has been, and is, low in Iran. In the table following is shown a comparison with certain other countries. Those countries near the Mediterranean are roughly comparable with Iran in climate and in degree of industrialization and urbanization, but they have been making relatively greater use of electricity.

Comparative Use of Electric Energy in 1948

Country	Population	Kilowatt-hour Production Per Capita of Total Population of Country	Kilowatt-hour Production Per Capita of Population of Areas Served
Iran	17,750,000	12	64
Turkey	19,500,000	32	155
Bulgaria	7,100,000	81	160
Greece	7,780,000	68	140
Lebanon	1,230,000	64	110
Algeria	8,660,000	53	170
Morocco	8,220,000	46	250
Spain	27,760,000	220	—
Japan	80,700,000	393	—
Brazil	48,450,000	51	—
Agentina	16,200,000	225	—
Chile	5,620,000	206	—
Mexico	23,880,000	134	—
Great Britain	48,670,000	956	—
United States	146,570,000	1925	—

The data in this table as to other countries are mainly from United Nations statistics, in part from other sources, and in a few cases are estimated projections from years prior to 1948. The energy data shown for Iran are rough estimates, since no central statistics of electric energy production are maintained, and data available from individual cities outside of Tehran and for industrial plants are very incomplete. The AIOC electric production is not included in the Iran figures.

It appears from the fragmentary data available that about 23 per cent of the total use of electricity is for general service to the public in homes, stores, hotels, restaurants, offices, public buildings, and street lighting, the remainder being used for factories, mines, railroads, and other industries. For the nearby countries it appears that the proportion for general public service is considerably higher than 23 per cent, which means that Iranian use in this class ranks relatively lower than in the industrial class.

The present low rate of electric use is by no means a result solely of the meager amount of lighting and power-using facilities installed in Iran. It has resulted in considerable part from actual shortage of power supply, arising both from insufficient amounts of generating equipment and from reduced capacity of this equipment due to lack of maintenance and rehabilitation, which has been accumulating since the early years of the war.

TYPE OF SERVICE

Outside of Tehran, industrial establishments using electric power usually have their own generating plants. Power for supplying utility distribution systems in the cities is usually from a separate generating plant, but in some cases it is furnished from one or more factory power plants installed and used primarily for factory purposes. In most cases there will be found several separate power plants in a single city, sometimes as many as ten separate plants. Even in the Tehran area the larger power users have separate power plants, five such plants being of appreciable size and operating normally interconnected with the municipal distribution system. This multiplicity of power plants in a single municipal area results, of course, in small sizes of individual generating units and high costs of electric energy.

Except for Tehran and a very few of the larger cities, electric utility service is not supplied on a 24-hour-per-day basis. In the smaller cities four to six hours in the evenings is usual practice; in the larger cities 12 to 15 hours with all-night service but no service during most of the daylight hours. This part-time service effectively prevents the use of utility system power for industrial plants, and it likewise excludes or limits the use of many electric appliances customarily used in homes, stores, and offices, such as irons, fans, cooking devices, refrigerators, evaporative air coolers, and pumps. This practice of supplying only part-time service apparently has three principal causes: first, presently established uses of electricity other than for lighting are so small that owners of utility systems consider it uneconomical to operate generating stations except during hours when considerable lighting load is on the lines; second, power may be supplied from a factory plant which is fully loaded during the daytime; third, the condition of the generating equipment is frequently so precarious that there is an understandable reluctance to increase operating hazards by extending the daily hours of operation.

TYPE AND CONDITION OF GENERATION FACILITIES

Based upon the incomplete information available, the present installed electric generating capacity in Iran would seem to be as follows:

Installed Electric Generating Capacity

(Approximate Figures)

Type of Plant Where Capacity is Installed	Generating Capacity Installed (kilowatts)	Per Cent of Total
Textile Plants	31,800	35
Sugar Mills	8,800	10
Food Processing Plants	4,400	5
Railroad	3,700	4
Miscellaneous Industry	14,700	16
Total Industrial	63,400	70
Utility—Ostans	13,200	
Tehran	13,500	
Total	26,700	30
Total Capacity	90,100	100

It should be noted that these figures are in terms of installed capacity, not of load. In addition to the installed capacity listed for utilities, they purchase considerable power from the industrial plants. Approximately 100,000 kw of AIOC capacity is not included above.

About 25 of the small cities have direct current service, but the total installed direct current utility capacity is less than 1,000 kw, so that its eventual replacement does not present a serious problem. Only a very small proportion of the industrial capacity is direct current. All alternating current generation is at 50 cycles.

Most of the generating capacity is in the form of diesel engine sets. Except for the 12,000 kw steam plant at Tehran, an 800 kw hydro-electric plant at Hamadan, and a few small hydro-electric plants, all of the utility capacity is diesel. The sugar mill capacity is nearly all in small turbines from which process steam is extracted, and there are some relatively small steam units in the other industrial categories, but by far the greater part of the industrial capacity is diesel. Nearly all of the diesel capacity is in small units, of less than 500 kw each; many are of less than 200 kw capacity. As stated above, many of these are of reduced capacity owing to need of rehabilitation.

Most but not all of the lost capacity in the larger diesel engine sets can be regained by thorough rehabilitation. A considerable proportion of the smaller diesel engine sets are probably not worth rehabilitation. For a rehabilitation program to be accomplished effectively and promptly, a central staff is needed to survey the situation and to give at least initial technical supervision.

In general the lost capacity in the industrial steam units is a less serious problem, but there are some instances of heavy deterioration in turbo-generators which probably

can be remedied only by returning the turbine rotors to the manufacturer. While steam boilers generally are in poor condition, their rehabilitation does not appear to be a difficult problem. The older portion of the municipal steam plant in Tehran, 6,400 kw, now 12 years old, appears to be in generally good condition.

TYPE AND CONDITION OF DISTRIBUTION FACILITIES

Present distribution systems have been developed principally for lighting service. Except at Tehran and at Isfahan (where remodeling and extension are under way) they are of rudimentary character. Extensive work will be required to provide for the larger loads contemplated.

With unimportant exceptions, distribution secondary voltages are standardized at 380/220 volts, and distribution primary voltages are standardized at 6,300 volts (3 wire.) Both voltages are satisfactory for Iranian conditions. The 6,300-volt primary circuits are nearly all run in underground cable, an unnecessary extravagance.

From such information as we were able to obtain, it appears that distribution systems in practically all of the principal cities are seriously overloaded. Secondary circuits are too long and of too small conductor size; primary circuits are too few and often of too small conductor size; there are too few distribution transformers, and no use is made of static capacitors on the 6,300-volt circuits to improve voltage regulation.

EXTENT OF SHORTAGE OF ELECTRIC POWER

The shortage of electric power exists not merely in the sense that increasing requirements for electric service cannot be met; there is inability, usually by a wide margin, to meet presently established uses of electric service, uses for which buildings are wired and power-consuming facilities—motors, lighting fixtures, etc.—are already in place.

Utility systems are not able to supply adequately the factories purchasing and seeking to purchase electric power. Most industrial establishments with integral power facilities are prevented by power shortage from attaining otherwise possible rates of production. Some have sufficient power for current rates of production, but not sufficient after other obstacles to full production are removed. Few if any factories have power available to increase their capacity or to round out existing factory productive capacity by installing more motor-driven equipment or larger motors.

Electric supply for general public use from the utility distribution systems in municipal areas is seriously deficient in both quantity and quality. In major parts of most cities, and in all parts of many cities, voltages at points of delivery to consumers are so low that electric lights are nearly valueless during those hours of the day when artificial lighting is most necessary.

According to information gained from interviews, questionnaires, and other sources, the number of applicants for service, temporarily rejected, usually range from 50 to 100 per cent of customers presently served. In cities where there has been new construction activity, a high proportion of these applications are for buildings already wired for service.

These conditions are a most serious handicap to the effective starting of many phases of the Seven Year Plan, especially so since electric power equipment requires a

relatively long period from start of work to completion ready for operation. There is need for prompt rehabilitation of existing power equipment and for expediting the placing of orders for some of the new power equipment required.

PROSPECTIVE ELECTRIC POWER REQUIREMENTS

The magnitude of a central station power program for Iran depends, step by step, upon progress in various phases of the economy. It cannot be determined or established as a separate program.

Since electric power requirements are a resultant of other developments, both under and apart from the Seven Year Plan, any initial power estimates must be regarded as tentative and subject to revision at intervals as the plans and prospects in respect of other developments become definite. This is particularly true for any given city or area, since revised decisions as to location of industrial projects may make substantial changes in power requirements of particular cities without material effect upon total power requirements.

LARGE INDUSTRIAL REQUIREMENTS

Large industrial loads, for the purposes of this report, are considered to be those served from primary voltage distribution circuits or direct feeders out of the power stations. This would normally include power loads down to about 100 kw in larger cities and down to possibly 50 kw in smaller cities.

In the central station program for the 34 principal cities, described later herein, there are included the estimated power requirements for all industrial establishments, existing and future, located in or near to these principal cities, subject to the following exceptions:

1. Present and future sugar mills are excluded, since their power requirements are expected to be provided by steam generating units using exhaust steam for mill processes.

2. Future cement mills outside of Tehran are excluded since their power requirements are expected to be provided by their own generating units, perhaps supplied with steam from waste heat boilers.

3. Certain large chemical projects are excluded, since they can be supplied most economically by integral power plants.

In estimating large industrial power requirements, account has been taken of the fact that full use of the productive capacity of existing industrial establishments in most cases will require substantially more power than is currently being used, and that the industrial projects to be carried out under the Seven Year Plan will result directly in substantial increases in power consumption. Further, it is estimated that there will be gradual growth in general industry and in electric power use from numerous industrial projects not covered by the Plan, especially in its later stages.

To a considerable degree, as a means to improve economy of production, new industrial projects with modern equipment and methods will require relatively more electric power than is used in existing plants of older design.

GENERAL DISTRIBUTION REQUIREMENTS

The electric loads supplied through the general secondary distribution system are of two classes:

1. Supply to the general public, for use in homes, stores, restaurants, hotels, offices, public buildings, street lighting, etc.
2. Supply for use in small industrial establishments.

Potential use of electricity by present customers with their existing lighting equipment and appliances is much above the actual present rate of consumption, particularly since lighting consumption is greatly reduced by low voltage in the distribution circuits. Existing lights and appliances would consume more electricity and would be used more freely if adequate service were being supplied. Also more lights and appliances would soon be installed. Homes and other buildings now wired for service but not connected would add substantial load as soon as service can be supplied.

The inauguration of 24-hour service would open the way for the use of many appliances now almost non-existent, such as electric irons, fans, small pumps, cooking devices, evaporative air coolers, and refrigerators in the large homes and stores. The evaporative air cooler in particular is likely to come into extensive use in parts of Iran where summers are dry and hot, not only in homes, offices and stores, but also in factories.

Increased residential and commercial uses of electricity are important items in improved standards of living. How rapidly they may develop depends upon a number of factors, such as:

1. Rate at which additional power sources for city systems and additional distribution facilities can be financed and constructed.
2. Rate at which full 24-hour service can be substituted for the part-time schedules now widely in effect.
3. Progressive reduction in charges for electricity as systems become larger and power generation and distribution more economical.
4. Rate at which the income and purchasing power of the people increases.

It is significant that to the extent that increased purchasing power of the people is expended in increased use of electricity, the direct effect is not inflationary. There would be here no bidding up of the price of goods which are in short supply. Assuming reasonable regulation of rates for electric service, the prices should go down as the sales increase.

Small industrial loads served through utility secondary voltage systems are presently nearly non-existent except in the few cities where full 24-hour service is in effect. It is probable that such loads will develop fairly rapidly, and may amount within a relatively few years to as much as 20 or 25 per cent of the total secondary distribution load. The establishment and growth of these small industries would have an important role in improvement of the Iranian economy.

POWER FOR IRRIGATION PUMPING

In interviews and in replies to questionnaires, the operators of the utility systems in numerous cases have indicated their expectation of being called upon to supply relatively large irrigation pumping loads, in some instances nearly as large as the general

distribution loads. At this stage, however, it is not clear how large such irrigation pumping loads may become or how soon they may develop, and to avoid confusion they have been omitted from our estimates of power requirements. For such as do develop and are within reach of a central station, more generating capacity must be added to the central station.

SUMMARY OF ESTIMATED ELECTRIC LOADS

The electric load estimates which we have used as a basis for a tentative central station program are shown by cities in Exhibit L-1. In summary these estimates for the principal cities are as follows:

Electric Power Requirements of 34 Principal Cities

Estimate for Year 1334

(Energy in thousand kwh)
(Peaks in kilowatts net)

	33 Cities	Kwh per Capita	Tehran	Kwh per Capita	Total 34 Cities	Kwh per Capita
Population Estimated in 1334	2,301,000		900,000		3,201,000	
Energy Production:						
General Distribution						
Sales—residential, commercial, etc.	116,190	51	121,500	135	237,690	74
Sales—small industrial	37,690	16	36,450	40	74,140	23
Total General Sales	153,880	67	157,950	175	311,830	97
Per cent Losses	24		22		23	
Station Output Including Losses ..	190,480	83	192,600	214	383,080	120
Load factor (per cent)	35		36		36	
Large Industrial Output Including Losses						
High at 60 per cent load factor ..	400,450	174	202,360	225	602,810	188
Low at 45 per cent load factor ..	300,340	131	151,770	169	452,110	141
Total Station Output						
High at 48-45-47 per cent load factor	590,930	257	394,960	439	985,890	308
Low at 41-39-40 per cent load factor	490,820	213	344,370	383	835,190	261
		W per cap		W per cap		W per cap
Station Peaks						
General Distribution for residential, commercial, etc.	46,520	20	46,980	52	93,500	29
For small industrial	15,070	7	14,090	16	29,160	9
Total general	61,590	27	61,070	68	122,660	38
For Large Industrial	76,190	33	38,500	43	114,690	36
Total station peaks	137,780	60	99,570	111	237,350	74
Comparison with 1331						
Station Peaks 1331	97,570	43	49,480	58	147,050	48
Added 1331-1334	40,210	17	50,090	53	90,300	26
Station Peaks 1334	137,780	60	99,570	111	237,350	74

The peak loads for the large industrial requirements, as shown in this table, are, of course, rough estimates. They are intended to represent the amounts of industrial load which will be simultaneous with the evening lighting peaks of the urban distribution systems. The aggregate daytime industrial peaks might be somewhat higher, although it is the general expectation that most major industrial establishments will be operated either for more than one shift or for a single long shift which will overlap the evening lighting peaks in winter months. With the establishing of 24-hour service in all principal cities, it is probable that in some cities the summer daytime peaks for all loads combined will eventually exceed the winter evening peaks. This situation, as to maximum annual peaks occurring in the summer in daytime, has become common in the southern and southwestern parts of the United States.

The kilowatt-hour requirements for the large industrial plants depend upon the nature of the industrial processes in the respective plants, and upon the number of working hours per day. Because of considerable uncertainty as to these elements a range of load factors is shown in the preceding table. These variations in load factors and in energy requirements do not affect the estimates of peaks or of new generating capacity required.

TYPES OF GENERATING PLANTS FOR IRAN

Formation of a program for central power station development over the next seven years involves at the outset an appraisal of the types of generating equipment best adapted for use under conditions prevailing in the various regions and at least a preliminary determination of the ranges of conditions under which each type of equipment should be used.

UNDERLYING CONDITIONS

Nature of Program

Each central station proposed is expected to become eventually the source for most of the electric power used in its city or area. Hence both economy in energy cost and reliability of service are prime objectives. Principal emphasis should be on long-range economy and reliability.

Hydro-Electric Possibilities

There seems reason to hope that further investigation will show that water power should be the principal type of development for some important regions, but, until its economic practicability is assured, the tentative central station program is set up on the basis of 100 per cent thermal power. Flexibility in planning to facilitate a possible later change to water power is an important consideration.

Fuels Available

The predominant type of fuel for most regions is and will be oil. Coal deposits are relatively scarce and are usually in thin seams difficult and expensive to work. Present mining methods are rudimentary and expensive, but for some regions it is expected that coal will be a more economical power fuel than oil.

Oil is plentiful, but is expensive except in the region close to present refineries. There is reason to hope that oil will be developed within seven years in central or northern Iran and that oil fuel may then be cheaper than at present in a considerable portion of the country. Even so, oil will be sufficiently expensive in most parts of Iran to justify high emphasis on thermal efficiency. Nearly all of the existing small diesel units in Iran are fired with gas oil. Diesel oil could be used in some cases with considerable cost saving. For the new diesel equipment in the proposed program it is expected that heavy fuel oil (mazout) will be used.

Natural gas may later be piped into Tehran and other cities relatively near to the gas source or along the route to Tehran. If gas should become available in certain cities, it presumably will be a cheaper power plant fuel than either oil or coal, and, along with its other advantages, should result in lower costs for electric power. The possible future availability of natural gas is a factor in selecting types of generating plants. We have given no consideration to possible future thermal plants in gas fields with long range electric transmission, since in general it is cheaper to transmit gas than to transmit electricity.

Repairs and Parts

The location of Iran with respect to manufacturers of power equipment means that repair and replacement parts require a long time for delivery, that assistance of skilled factory technicians is difficult and expensive to secure, and that repairs requiring shipment of equipment back to the manufacturer involve great expense and loss of service. This means that it is false economy to buy apparatus other than of good quality and high reliability. It also points to the advisability of standardizing on a relatively few types and sizes of diesel equipment, so that complete stocking of repair parts is practicable.

COMPARISON OF STEAM AND DIESEL PLANTS

Until all questions with respect to the availability of fuels are settled, it will not be feasible to determine the type of power plant best suited to a particular location. By and large, however, underlying conditions would seem to favor the use of diesel plants over steam plants to a greater degree than would be true of many other countries. The relative advantages and disadvantages of each type may be summarized as follows:

1. The investment cost of steam plants per kilowatt of output is much higher than diesels except in large sizes. For units under 2,000 kw it would be practically prohibitive.

2. For comparable sizes of plants, costs of maintenance and operation, except fuel costs, are somewhat lower in the case of steam plants.

3. For the range of sizes of plants usable in Iran, fuel efficiency is substantially lower in steam plants.

4. In small sizes, steam units are less likely to suffer serious damage from unskillful operation and neglect, but this is not true in the case of larger steam units such as 10,000 kw or greater. Steam units are less liable to unscheduled shutdowns because of accidents, but when damage or serious deterioration has occurred repairs may take a long time as it may be nec-

essary to ship a steam turbine back to the manufacturer. In the case of a diesel plant of the same total capacity, there are likely to be more units, so that shutdown would not be complete, and in any event repair time is likely to be less.

5. Reliability of small, high-speed diesel units is usually poor, especially with unskilled attendance. This is not the case with respect to large, slow-speed diesel units.
6. Overload capability of steam plants is somewhat greater than that of diesel plants.
7. Diesel plants can be moved to a new location at moderate cost. The salvage value of a steam plant for installation elsewhere is probably less than its value as a standby unit in its original location.
8. For local conditions, we believe that steam plants would have a longer useful life expectancy than diesel plants. For purposes of setting rates for depreciation and amortization we believe that 35 years of useful life may be expected for steam plants, whereas for diesel plants the rates should be based upon 20 years for medium-sized 4-stroke engines, and 25 years for large, slow speed 2-stroke engines.

In the attached table, Exhibit L-2, is a comparison for Iranian conditions of original investment cost and performance of steam and diesel units for a range of sizes and types.

The table below shows a comparison of estimated energy costs per kilowatt-hour for the types of plant shown in the previous table.

Estimate of Comparative Energy Costs in Rials per Kilowatt-Hour For Various Sizes and Types of Generating Units

Size of Plant	Fixed Charges	Operation Except Fuel	Total Including Fuel At Prices as Stated Below in Rials per 10,000,000 kcal			
			400	800	1200	1600
STEAM						
2—2000 kw units	0.49	0.26	0.93	1.11	1.29	1.47
2—5000 kw units	0.34	0.14	0.63	0.78	0.94	1.09
2—10,000 kw units	0.28	0.08	0.51	0.66	0.81	0.95
2—20,000 kw units	0.25	0.06	0.44	0.57	0.69	0.82
			440	850	1260	1670
DIESEL						
2—300 kw units	0.49	0.86	1.49	1.62	1.75	1.88
2—500 kw units	0.45	0.60	1.18	1.30	1.42	1.53
2—1000 kw units	0.41	0.39	0.92	1.03	1.15	1.26
2—2000 kw units	0.35	0.23	0.71	0.82	0.94	1.06
2—3000 kw units	0.33	0.17	0.62	0.73	0.85	0.96
2—5000 kw units	0.32	0.12	0.56	0.67	0.79	0.90

NOTES: Fixed charges assumed at 11.4 per cent of investment for steam, 13.4 per cent of investment for diesel up to 1000 kw, 12.4 per cent over 1000 kw.

Cost based on heavy fuel oil (mazout), with premium as shown for more strict specifications and handling for diesel fuel.

This comparison of estimated energy costs involves two arbitrary assumptions: first, that the annual load factor is 40 per cent; of course, it may be considerably higher, and for a higher load factor the comparison would be more favorable to diesel equipment, because of its higher fuel efficiency. Second, that fixed charges, except depreciation, will aggregate 10 per cent per annum to allow for property taxes, income taxes, insurance, and

return on investment. This percentage may be high, but except for small plants the magnitude of this percentage has only minor effect upon the comparison. Depreciation is computed on the four per cent sinking fund basis for the service lives noted above.

In these calculations the estimates for steam stations are based upon use of oil fuel and of cooling towers for condensing water. For coal fuel, investment cost would be about Rls. 1000 per kw higher and operation costs (other than fuel) about 20 per cent higher; the cost per kwh would be about Rls. 0.8 higher with 2000 kw units and Rls. 0.06 higher with 5000 kw units. For a location with a river for condensing water, investment cost would be lower by about Rls. 400 per kw and thermal efficiency would be three to four per cent higher.

The highest fuel oil price shown in the table is Rls. 1600 per 10,000,000 kilocalories (kcal). There are many places in Iran where the present price is more than this: Tabriz 2040; Rezaiyeh 2315, Meshed 2230, and Yezd 1985. With improved transportation and larger volume of use, however, the eventual price is not likely to exceed Rls. 1600 in any of the principal cities except perhaps Kerman.

Respective Fields of Steam and Diesel Plants

In the tentative central station program presented later herein, the following conclusions are embodied as to the respective fields of the two types of thermal power plants.

Steam stations should be used where the initial fuel or the expected future fuel is coal. To justify the use of two 2000 kw coal-fired steam units over four 1000 kw diesel units, the expected future price of coal per kilocalorie should be cheaper than heavy fuel oil by at least 25 per cent, and to justify the use of 5000 kw coal-fired steam units over 2000 kw or 3000 kw diesel units, the expected future price of coal per kilocalorie should be about 10 per cent or more below the comparable price of heavy fuel oil.

Where the initial and expected future fuel is expected to be oil or natural gas, there seems to be no justification for using steam units for any thermal plant where the steam unit size would be less than 5000 kw in areas of low oil cost or less than 10,000 kw in areas of high oil cost.

For Tehran, where 10,000 kw steam units are proposed initially with 20,000 kw units expected at a later stage, the initial use of steam units is within discretionary range. Diesel units of 3000 kw to 5000 kw for the early stage, followed by 20,000 kw steam units later, would seem to be equally justifiable. It is possible, however, that the thermal power program for Tehran will be largely supplanted by hydro-electric installations.

Steam units are necessary for industrial installations where power is generated from process steam or where waste heat or waste gas boilers are used.

As stated hereinbefore, the investment cost and the operation and maintenance costs of diesel plants decrease rapidly as the size of unit is increased, and there is an improvement in fuel efficiency in sizes up to about 1000 kw. Reliability is progressively improved with increased size, at least up to about 2000 kw. Accordingly, in the new central station installations the sizes of initial diesel units should be as large as practicable, and should usually be fixed by what is considered appropriate for the installation as it is expected to be five or six years later. This may involve some initial over-building with consequent higher initial investment, but this can usually be justified by the higher subsequent economy. There would be some initial operating hazard due to so high a proportion of the

station capacity being in a single unit, but the reliability of a modern diesel unit for the first few years should be high.

Reliability of diesel units, assuming proper operation, is partly a matter of high intrinsic quality in the design, materials, and workmanship entering into the engine, and partly a matter of engine speed. Engine speed represents a compromise with engine costs. High-quality 2-stroke engines, which obtain nearly twice the power output per cylinder possible with the 4-stroke cycle, usually have lower engine speeds than would be economical with 4-stroke engines, and hence are likely to be more reliable, but 2-stroke engines are less efficient than 4-stroke engines, especially small sizes. For Iranian conditions, where there is a considerable premium on high reliability and in most regions on high fuel efficiency, the best overall balance seems to be:

300 kw and 500 kw units, standard 4-stroke cycle, medium slow speed

1000 kw units, supercharged 4-stroke cycle, medium slow speed

2000 kw and over, 2-stroke cycle, very slow speed.

HYDRO-ELECTRIC POWER POSSIBILITIES

It is possible that hydro-electric power can be developed for use in certain areas of Iran, including Tehran, at costs so low as to supplant any further development of thermal power in those areas. If so, the lower costs of hydro-electric energy may offer a significant stimulus to development of certain types of industry and may make possible more widespread use of electricity by the general public. Further investigation is necessary before this possibility can be evaluated. Favorable conclusions from such investigation might mean that a considerable part of the power development in the latter part of the Seven Year Plan would be hydro-electric.

Possible hydro-electric developments in Iran fall into three general classes:

1. Power projects in connection with dams and storage reservoirs on relatively large rivers and streams where the development is primarily for irrigation or water supply. While certain projects in this class are deserving of further investigation, there is no present reason to expect any substantial development of this type of hydro-electric power within seven years.
2. Projects with dams on larger rivers and streams, intended primarily for power. It is doubtful if many such projects would be economically feasible in Iran, and there seems no prospect for early developments of this type.
3. Power developments without reservoirs located on streams in steep mountain valleys and intended for power only. Such projects would involve diverting water from a stream at high elevation, carrying the water for a considerable distance along one side of the valley through a pipeline or tunnel, and dropping the water back into the stream through a steel penstock supplying water turbines. Such plants utilize only the dry season flow of the stream. They usually have a small regulating pond at the diversion works or at some point along the pipeline to enable utilization of the low water flow at a 40 or 50 per cent daily load factor.

This third type of development offers interesting possibilities for some of the snow-fed streams on the northern side of the Elborz Mountains and possibly in some other sections. This type of water-power development is of particular interest for the reasons that even small developments may be economical and that the usable fall in a

certain stream may be developed in more than one stage. This means that the size of initial power plants may be adapted to initial power needs of an area, and subsequent plants added later when power needs increase.

As illustrations of the possibilities offered by this type of high-head development, the following table shows amounts of power available from a ten-kilometer section of streams of various sizes and gradients, together with comparative investment costs and energy costs. It is important that there be no misunderstanding of the significance of these cost figures. They do not represent estimates of cost of any known projects in Iran. They merely show what the costs might be for streams of certain sizes with certain gradients, if such streams with such gradients can be found in Iran, and if the conditions for construction should prove to be generally similar to those which have been found in mountain streams in other countries. The costs shown are merely the Iranian equivalent of present day reproduction costs with average construction conditions for typical high-head projects in the United States. For favorable local construction conditions, costs would be lower; for adverse local construction conditions they would be higher. On the basis of the assumed conditions, these costs are on a comparable basis with the thermal power costs shown hereinbefore execpt that the hydro-electric costs include a larger safety margin to cover uncertainties. For this table also 10 per cent has been arbitrarily assumed for fixed charges other than depreciation. Either a lower fixed charge or a higher load factor than 40 per cent would result in a more favorable comparison for the hydro-electric plant.

It will be noted that while in general larger capacity developments have lower costs than those of smaller capacity, increasing steepness of the stream gradient is a more important factor in reducing costs than is increasing size of the river.

High Head Hydro-Electric Power Possibilities

Capacities and Investment Costs of Hypothetical Plants for Various River Flows and River Gradients

Flow of river cms					
Minimum low water	0.5	1	2	4	8
Utilizable with pond for regulation to 40 per cent daily load factor	1.25	2.5	5	10	20
Capacity of plant kw					
200 meters in 10 km	1,650	3,400	7,100	14,500	29,800
400 meters in 10 km	3,750	7,600	15,500	31,300	63,400
600 meters in 10 km	5,800	11,700	23,800	—	—
Cost of plant rials/kw					
200 meters in 10 km	23,300	18,800	13,400	11,900	10,700
400 meters in 10 km	14,600	11,800	9,200	8,000	7,000
600 meters in 10 km	12,600	10,200	8,200	—	—
Energy cost rials/kwh					
200 meters in 10 km	0.83	0.67	0.46	0.40	0.36
400 meters in 10 km	0.52	0.41	0.31	0.27	0.23
600 meters in 10 km	0.44	0.35	0.27	—	—

NOTES: Estimates for 1.25 and 2.50 cms based on steel or wood pipe lines, for 5, 10 and 20 cms on tunnels in rock.

Fixed charges, including depreciation, assumed 10.8 per cent for pipe line plants and 10.6 per cent for tunnel plants.

For development lengths of river longer or shorter than 10 kilometers the power capacity will vary with the length with little change in cost per kw for the same gradient.

Small hydro-electric developments such as those shown in this tabulation would not be considered particularly cheap in the United States where power is developed on a much larger scale and where power plant fuel is generally cheaper than in Iran. Considering, however, the sizes of power plants needed in Iran and the present and expected future fuel prices, these hydro-electric costs, if confirmed by investigation, may be exceedingly attractive.

Another feature is of interest. The costs per kilowatt-hour of hydro-electric energy are computed on the basis of 40 per cent annual load factor use of the plant capacity (3504 kwh per year per kw of plant). Actually for most of the year, outside of the dry season, the full power output will be available for 24 hours per day. Ways would almost certainly be found to utilize some of the secondary and off-peak hydro-electric energy and any such utilization would add to the value of the development. One device frequently used is to install supplementary electrically-heated steam boilers for producing process steam in textile plants and other industrial plants. Another use is for small electric furnaces for chemical or metallurgical operations which do not need to be continuous.

To develop more clearly the economic possibilities of high head developments of this type, a few illustrations are shown below. These are illustrative examples only; pending investigations no real estimates can be made.

Haraz River for Serving Tehran

From the vague and fragmentary data available, the minimum flow of the Haraz River where it is formed by the junction of the Nur and the Lar is of the order of 15 cubic meters per second (cms). To allow for the eventual diversion of the upper Lar to the south side of the mountains, this minimum flow should be reduced to 12 cms. On a 40 per cent load factor basis 12 cms would permit development of power capacity for a peak use of 30 cms. Between the Nur-Lar junction and the mouth of the Haraz gorge, in a tunnel distance of about 20 km, there seems to be a fall of 400 to 500 m. If confirmed, these figures would indicate a possible power capacity of 90,000 kw to 115,000 kw.

Probably this total capacity could be developed in two successive stages; for illustration, 65,000 kw at first with the remainder of the fall left for later development as Tehran power loads grow. For the 120 km transmission to Tehran, two 110 kilovolt (kv) circuits might be used at first with a third circuit later. Consistent with the hypothetical costs used in the illustrative table above, this Haraz possibility would compare with steam at Tehran as follows, using fuel prices at Tehran of Rls. 750 per 10,000,000 kcal, which is about 12 per cent below present price. The comparison shows investment in hydro-electric and steam plants and the corresponding energy cost which includes 10 per cent of investment for fixed charges.

	Investment In thousands of Rials	Energy Cost	
		In thousands of Rials	Rials per kwh
Hydro-electric on Haraz River			
Power plant, 65,000 kw	490,000	57,500	0.25
110 kv lines and substations	130,000	15,500	0.07
3 per cent added losses to 20 kv bus	—	—	0.01
Total delivered 63,000 kw	620,000	73,000	0.33
Steam at Tehran			
Power plant, 3-21,000 kw units	452,000	114,200	0.52
Substation, 6300 volts/20 kv	18,000	2,300	0.01
Total steam 63,000 kw	470,000	116,500	0.53
Excess investment with hydro-electric plant	150,000		
Saving in energy cost with hydro-electric after allowing for 10 per cent fixed charges plus depreciation on the excess hydro-electric investment		43,500	0.20
Saving in percentage		37	37

This comparison of hypothetical costs for 65,000 kw of Haraz development with costs for 3-21,000 kw steam units at Tehran really considerably understates the potential saving, since the costs are computed for 40 per cent load factor, which is assumed to be the load factor of the total Tehran load. In practice for most of the time there would be water available to operate the hydro-electric plant at higher load factor, and this could be done by using the 30,000 kw to 40,000 kw of earlier Tehran generators for carrying load only during the peak hours and transferring their component of off-peak power to the hydro-electric plant. In this way possibly 50,000,000 kwh additional energy annually might be carried at no additional cost but with a fuel saving of perhaps Rls. 12,500,000, in addition to the saving of Rls. 43,500,000 noted above.

On the other hand, it should be noted that whereas the steam units may be installed year by year as needed, the investment in the 65,000 kw of the hydro-electric power and its transmission system would need to be made all at once, simultaneously with the investment in the first of the three steam units. The hydro-electric project would be self-sustaining in its first year in the sense that all of its fixed charges would be covered by savings in operating expenses, but the 37 per cent annual saving indicated in the table above would not be realized until several years later, when the hydro-electric plant would have saved installation of all three steam units.

Hydro-Electric Power for Shahi Area

In the electric power program presented later herein, there is proposed a 10,000 kw steam power station at Shahi to supply a 33 kv transmission grid serving the growing loads of the Shahi-Babul-Sari-Behshahr area. This station would consist of one 5,000 kw steam unit to be installed as soon as possible, followed by a second 5,000 kw unit to be ordered probably in 1331 for service in 1333. A possible alternative to the second 5,000 kw steam unit would be a small hydro-electric plant (or plants) of somewhat the same capacity.

There are at least three streams which should be investigated as such an alternative, Babul Rud and Sedj Rud west of Shahi and a somewhat larger stream just east of Sari. All three streams rise in snow-covered mountains and appear to have sections where the stream gradient is high. A suitable development, if found on any of the streams, could be connected with the 33 kv grid by a short 33 kv line. In this area the annual load factor can be assumed as at least 50 per cent, as most of the year the first steam unit could be run at a low load factor such as 20 per cent or 25 per cent with the hydro-electric unit at 60 per cent or 55 per cent, giving an average for the total of 40 per cent, and the load factor of the load itself in this area will probably be higher than 40 per cent. With 50 per cent annual load factor, approximately 5,000 kw might be obtained from combinations of minimum stream flow and gross hydraulic head as follows:

0.5 cms and 650 m head

1.0 cms and 330 m head

1.5 cms and 225 m head

Depending upon the steepness of the gradient in which these heads may be found, the cost per kilowatt of the power developed might perhaps range from Rls. 16,000 to Rls. 12,000. Assuming Rls. 14,500 per kw for a hypothetical hydro-electric plant operated at 50 per cent load factor, 25 kilometers of 33 kv line with a negligible increase in losses, and a future price of Rls. 550 per ton for 6,300 kcal coal at Shahi (present price understood to be about Rls. 700), a comparison of costs for the hydro-electric and the second 5,000 kw steam unit would be as follows (same basis as Haraz comparison):

	Investment	Energy Costs	
	In thousands of Rials	In thousands of Rials	Rials per kwh
Hydro-electric (50 per cent load factor) power plant 5250 kw	76,000	9,300	0.40
33 kv lines and substations	7,000	900	0.04
Total hydro-electric	83,000	10,200	0.44
Steam (50 per cent load factor) power plant 5250 kw	52,000	15,900	0.69
Excess investment with hydro-electric	31,000		
Saving in energy cost with hydro-electric after allowing for 10 per cent fixed charges plus depreciation on the excess hydro-electric investment		5,700	0.25
Percentage saving		36	36

Pul-i-rud for Serving Resht Area

About 70 km east of Resht is a stream called Pul-i-rud. Judging from the location and character of the area which it drains, the minimum flow may be four cms or more. From available maps it appears that between its rather flat upper valley and its lower valley there is a difference in elevation of more than 700 m and that probably a considerable proportion of this fall is concentrated in a relatively short distance. Possibly as much as 40,000 kw at 40 per cent load factor might be developed, and if stream gradients should be as steep as the maps indicate, the costs may be low. While a development of such a size is too large for immediately prospective loads in this region, a short section

of the river fall might be developed in such a way as not to interfere with subsequent development of the remainder. An initial development of 12,500 kw could be made with four cms flow and about 165 m of river fall, which might require only a few kilometers of small diameter tunnel or pipe line.

Analysis of a hypothetical development at this site, assuming development conditions to be favorable, may serve to illustrate several aspects of hydro-electric power economics: first, that the cost of initial development beyond immediate needs is not prohibitive, particularly for areas where fuel is expensive; second, that the investment will not later be made uneconomical if there should be a drastic reduction in oil fuel costs; third, that a heavy investment in fairly long and initially underloaded transmission lines is not necessarily prohibitive; fourth, that power for smaller cities, which is expensive on the basis of independent supply, may be secured at relatively low cost by tapping transmission lines built primarily to serve larger cities.

Resht, together with Pahlevi to the north and Lahijan and several smaller towns to the east, may within seven years have a combined load of 10,000 kw or more. Fuel oil is presently expensive (heavy fuel oil Rls. 1455 per ton and gas oil for small diesels Rls. 2170 per ton in Resht, higher in the surrounding towns), but if oil should eventually be produced and refined in the western Caspian area, the local price of fuel oil might fall to one-third of present prices. In the following table are shown the comparisons with diesel costs of a hydro-electric project comprising a 12,500 kw plant on the Pul-i-rud, a 66 kv line from the power plant via Rudsar, Langarud and Lahijan to Resht and thence to Pahlevi, with a second 66 kv line direct from the power plant to Resht (about 215 km total). Further study might show some different transmission plan to be cheaper or better suited to long range development of the region. Comparison with diesel costs is shown on three bases, (a) with 8500 kw of capacity needed and fuel at 85 per cent of present prices, (b) with 12,000 kw of capacity needed and fuel at 85 per cent of present prices, and (c) with 12,000 kw of capacity needed and fuel at 33 per cent of present prices.

Comparison of Hydro-Electric with Steam Investments and Energy Costs

Including 10 Per Cent Fixed Charges

		Investment	Energy Cost	
		In thousands of Rials	In thousands of Rials	Rials per kwh
Hydro-electric (40 per cent load factor)				
Power plant	12,500 kw	106,000	12,700	0.29
Lines and substations		117,000	15,200	0.35
Added losses 4 per cent		—	—	0.02
Total deliverable	12,000 kw	223,000	27,900	0.66*
Diesel equivalent early stage				
Total load on grid 10,000 kw				
Fuel at 85 per cent of present prices				
Units avoided or moved out				
Large units	6,000 kw	59,000	21,800	0.96
Small units	2,500 kw	31,000	15,700	1.80
Units shut down	1,500 kw	—	4,400	0.84
Total	10,000 kw	90,000	41,900	0.99

		Investment In thousands of Rials	Energy Cost In thousands of Rials	Energy Cost Rials per kwh
Excess investment with hydro-electric		133,000		
Annual saving with hydro-electric after fixed charges			14,000	0.33
Percentage saving			33	33
Diesel equivalent later stage				
Fuel at 85 per cent of present prices				
Units avoided or moved out				
Large units	9,000 kw	86,000	28,700	0.91
Small units	3,000 kw	39,000	20,600	1.96
Total	12,000 kw	125,000	49,300	1.17
Excess investment with hydro-electric		98,000		
Annual saving with hydro-electric after fixed charges			21,400	0.51
Percentage saving			43	43
Diesel equivalent if fuel prices fall to 33 per cent of present				
Units avoided or moved out				
Large units	9,000 kw	86,000	21,900	0.69
Small units	3,000 kw	39,000	17,100	1.63
Total	12,000 kw	125,000	39,000	0.93
Excess investment with hydro-electric		98,000		
Annual saving with hydro-electric after fixed charges			11,100	0.27
Percentage saving			28	28

* Cost per kwh of hydro-electric energy is 20 per cent higher at the early stage due to fact that 2,000 kw capacity is wasted.

General

It should again be emphasized that neither these three illustrative analyses nor the preceding table of hypothetical costs represent estimates of what hydro-electric power of the high-head type is expected to cost in Iran. The combinations of stream flow and stream gradient used in the illustrations may not exist, and, if they do exist, construction conditions may be such that costs would be different. The illustrations are merely to explore, if the assumed conditions should be found, what might be the relation between costs of thermal power and costs of hydro-electric power plus transmission. Their purpose is served if they bring out that attractive possibilities are indicated, the investigation of which is worth while.

Such investigation should be prompt, since power capacity will probably be added in the coming seven years at a more rapid rate than later, and the chance for Iran to

gain the benefits of the low hydro-electric power costs may largely be lost if the construction is delayed until a large program of thermal power construction has been carried out. If the possibility of low-cost power from these high-head projects on relatively small rivers should materialize, it would be well to have at least a few such sites developed before the end of the seven year period. A few successful examples would stimulate interest in others and would simplify their financing.

All of the investigations essential for decisions to start development of hydro-electric projects at some of the more promising sites could be completed within a year or less except the determining of minimum stream flow. While, of course, a reasonably good approximation to minimum stream flow is important to a decision, a highly precise determination is not essential. With these high-head projects a major part of the cost is in pipe lines or tunnels, and in penstocks, both of which depend mainly on the amount of flow selected for development. This means that if minimum flow of stream has been underestimated, the plant as built may be smaller than it could have been, but its economics are not impaired; while if the minimum flow has been overestimated, the full designed capacity of the plant can still be secured at times of peak loads (assuming the project included a daily regulating pond). The only economic penalty for the overestimate is a lower plant load factor during the dry season, not a serious penalty if the project is to be interconnected with even a small amount of thermal capacity which can carry high daily load factor during the dry season, thus enabling the plant to operate its full capacity at a temporarily low daily load factor.

In all of the preceding illustrative comparisons of hydro-electric and thermal power costs, the investment required for the former plus transmission was greater than for an equivalent capacity in thermal power, but large savings in annual costs are indicated after providing for the fixed charges (including normal return on investment) on the entire amounts of hydro-electric and transmission investments. These savings in power cost should not be regarded primarily as additional profits on the investment but mainly as a means of reducing costs of power for use by industries and by the general public and thereby making possible its wider use, with attendant benefits to the economy of the region and to the standards of living of the people.

GENERAL PLAN FOR ELECTRIC POWER DEVELOPMENT

A program for supplying the increased requirements of power in the next seven years must be such that industrial requirements at least are met as promptly as the time required for construction and the available funds will permit. It must aim eventually to meet all requirements adequately and to provide a type of power supply which will be reasonably reliable and will yield as low power costs as it is possible to secure. None of these objectives can be met, and in particular the objective of low power costs cannot be met, without a carefully developed basic plan and an effective carrying out of that plan. Such a plan must be comprehensive in scope. No adequate power supply can be evolved based upon a policy of endeavoring to meet independently the individual power needs as they arise from time to time at various places.

CENTRAL STATIONS FOR PRINCIPAL CITIES

The predominant principle embodied in the power program which we propose is that future power supply for each principal city, or in some cases for a group of cities, will be provided from a central station. This central station in general should supply

the power for all industrial and railroad establishments in or adjacent to the city, should supply irrigation and water supply pumping located near the city, and should supply the general distribution system in the city.

Existing industrial power plants should, of course, continue to operate until such time as it becomes economical for them to be relegated to standby or reserve status or to be dismantled for salvage and transfer of the power equipment to other locations, usually isolated industrial plants or small towns, for which it may be considered appropriate. An existing utility plant, if not suitable for expansion into the regional central station, should likewise be operated until it is economical to put it in standby status or to salvage the equipment. These earlier generating stations should ordinarily be operated interconnected with the new central station.

The principal exceptions to the policy that no new power facilities should be installed except at the regional central station are those industrial establishments which require sufficiently large amounts of industrial process steam to warrant the installation of back pressure or extraction steam turbines (such as sugar mills), or which can economically install waste heat boilers (such as cement mills), or which have waste gases available for boiler fuel. Even in these cases, the amount of local power equipment to be installed should be matched to the amount of process steam, waste heat or waste gas normally available, and any deficiency in meeting the electric power needs of the industrial establishment should be made up from the central station and any surplus of local power produced should be absorbed by the central station system. Ordinarily such a local plant should not install spare equipment but should depend upon the central system for its reserve.

In a case where the power requirements of a single new factory will be the major part of the total power requirements of the region, the new central station might be installed adjacent to this factory and could be operated by the factory, but in such a case the factory should assume the firm responsibility of supplying as a public utility all other new power loads of any type which may arise in the region for a considerable time ahead.

The reasons for firm adherence to the principal of the single central station are as follows:

1. Large stations using the largest practicable size of generating units are more economical in investment per kilowatt, in operation costs, and in fuel consumption than would be the case with several smaller stations.
2. Large stations are in a better position to secure supervisory and operating staff of adequate ability and training.
3. Pooling of all power supply through a single central station system enables full advantage to be taken of the diversities among the separate power loads. Some of the individual power loads will have their maximum peaks at different hours of the day or at different seasons of the year from others, and hence when pooled the combined peak will be less than the sum of the separate peaks, often substantially less. This means that the total power loads can be carried with less aggregate capacity by the central station than would be required in several separate stations. There is also a saving due to the fact that separate stations would require more aggregate spare capacity for assurance of adequate service.
4. The addition of new generating capacity to meet aggregate growing loads can be provided more simply and economically by a central station than by several stations.

5. The central station, except in unusual cases, would have the responsibility of providing the requirements of all new power users who from time to time desire to take service from it. It will be in better position to meet this responsibility if it is assured of being the normal source for all new power loads.
6. With its larger size and its better assurance of a steady and growing market, the central station will probably be in more favorable position to finance the new investments periodically required, especially if it is part of a regional power organization responsible for a number of central stations.

However, if the central station is to be in a favored position as the prospective supplier, except in special cases, of all power for expansions of existing factories and for new factories, it must accept certain responsibilities. It is not reasonable to expect industrial or other large users to forego the installation of their own power supply unless they have reasonable assurance that the central station supply, compared with their private power supply, will be at least as reliable, will give at least as high quality of service, and will be at least as cheap and probably somewhat cheaper. This assurance, furthermore, must be real and continuing.

It would not be surprising if difficulties and complications are encountered in the establishment and carrying through of this central station policy. There should be no attempt to enforce it by arbitrary or high-handed measures. In particular, there should be no legal prohibition upon industrial or other large power users, not Government-owned, against installing their own power facilities if they desire so to do and can raise the funds to pay for the facilities. There are, however, certain steps, both positive and negative, which can be taken.

On the negative side, certain temporary measures inhibitory to separate power installations may be taken. The Plan Organization may designate for each principal city or group of cities an Approved Central Station, either an existing station suitable for expansion or a new station, such designation to be made as soon as adequate arrangements for proceeding with the central station installation can be worked out. After an Approved Central Station has been designated for a certain area, neither the Seven Year Plan aid nor foreign exchange at the official rate should be afforded to any other installation of power facilities in that area by any private or any Government agency unless the applicant shall be able to show that:

1. There are special features, such as use of process steam, waste heat or waste gas, which render his proposed installation more economical.
2. There are unusual circumstances as a result of which the Approved Central Station is clearly not able to furnish service of sufficiently reliable character or at a cost comparable with the total cost reasonably to be expected from the proposed installation.

These practices, including designation of an Approved Central Station, should be temporary, as they probably would not permanently be in the public interest. Eventually the central stations should maintain their positions on their own merits. Probably the practices should expire at the end of the Seven Year Plan.

Positive measures, however, are more sound and efficacious than negative measures. They should consist of working out, situation by situation, arrangements whereby the central station will be constructed and operated on a sound and economic basis, will be

assured of sufficient funds to carry through its initial program and, so far as assurance is feasible, will be in a position to secure funds for foreseeable expansion, will give preference to industrial users in times of power scarcity, and in general will be financially able to sell power to industries at rates somewhat cheaper than the cost of industrial self-supply. Under these conditions, most industries will probably prefer to purchase power rather than to generate power for themselves.

As has been noted earlier, it may be found after further investigation that the development of hydro-electric power on a substantial scale may be economically practicable and advantageous in certain areas. In such event, the central station policy might need to be carried further, with the central power source being a transmission grid fed by one or more hydro-electric plants and with a number of cities or load centers being supplied from the grid. In the absence of hydro-electric power, there seems to be little economic need for early development of transmission grids, even on a local scale, except in a few cases where cities are relatively close to each other. A particular instance is the Tehran area, where it is expected that a number of small cities within 20 to 40 kilometers of Tehran will eventually be interconnected with the Tehran generating system and draw their main power supply from it.

ELECTRIC SERVICE FOR SMALLER CITIES

The improvement of electric service for smaller cities now having wholly inadequate service and the extension of electric service to smaller cities and villages now having no electric supply must be an ultimate objective of any program looking to improvement of productivity and living conditions for the Iranian people. It is at this time uncertain how fast it will be practicable to proceed with this phase of an electric power program, in view of heavy expenditures required for developments in the agricultural, industrial, and transportation fields.

There are about 45 smaller cities which have some form of electric service, usually inadequate for present needs, and often consisting only of a lighting circuit supplied from a small local factory or from a single diesel set. There are about 15 cities of over 10,000 population which have no electric service.

In the specific program later herein presented, we have included, outside of the 34 principal cities, the installation of a blanket amount of 8,200 kw of generating capacity. No specific locations are recommended for this capacity, but it is considered to be largely for locations where there will be increasing power requirements for industrial use.

The central station program proposed for the principal cities has considerable indirect relation to the problem of making power supply available at reasonable cost in smaller cities, either by direct supply to a smaller city over a distribution circuit from a nearby central station or by transfer to a smaller city of existing small diesel engine sets which will be superseded by the new central stations.

With respect to direct supply to a smaller city, most of the central stations proposed would operate at 6,300 volts and would generate kilowatt hours at about one-half of the costs possible from the type of diesel stations that could be installed in the smaller cities in the same region. With such a differential in station costs, it would be possible to supply a small city over a 6,300 volt circuit up to perhaps 20 kilometers from one of the central stations, and the costs of such supply should be 25 per cent or more below the costs of local generation. For longer distances, a city with a load in the order of 700

kw to 1,000 kw or larger could probably be served adequately over a 33 kv transmission circuit for a distance up to 35 kilometers from one of the central stations at a cost substantially below the cost of local generation.

In some cases, where a central station in one of the principal cities may have a considerable margin of spare capacity, the requirements of a nearby small city might be supplied for a time with no increase in generating capacity; in other cases an additional generating unit might need to be installed sooner than otherwise would be necessary. The proposed central program in any event can be of substantial assistance to improvement of service in smaller cities and villages over a considerable radius.

There will probably be many cases where the existing generating station is not suitable for expansion and the proposed central station will have to be started at a new location. This creates an uneconomical situation when both new and old stations are needed to carry the power load. A substantial saving could be effected by installing one additional large unit in the new central station and shutting down the old station entirely, thus saving a complete operating force at the old station and replacing the generation by the small units with much more efficient generation by the large new unit. To make possible this saving, the operators of the central station could afford to sell the small generating units at a low price. Such of these small units as can be satisfactorily reconditioned may be quite suitable for installation in the smaller cities, since it would be impracticable in any case to install large units, and substantial savings should be realized over the cost of new units. Diesel units in this class might range from 100 kw to 300 kw. Larger units would usually be retained and smaller units than 100 kw would seldom be worth reinstalling, although they might be used in some cases in village plants.

TECHNICAL FEATURES OF GENERATING STATIONS

During the next seven years there will be more things needed in Iran than can be done with the available investment funds, and more power facilities will be needed than can be financed. This means that the utmost economy must be followed in design and construction of generating stations consistent with securing stations which will be economical in production cost and reasonably reliable. In particular unnecessarily large and expensive buildings should be avoided.

Outside of Tehran, the central stations recommended are all of the diesel type except in three cases where coal is expected to be a cheaper fuel than oil. Diesel equipment is more efficient in fuel consumption and will give wholly satisfactory service if of good quality, if not overloaded, and if scrupulously and intelligently maintained. The engines to be ordered should be of high quality and of relatively slow speed in relation to their size. In the larger sizes the very slow speed 2-stroke cycle type is preferable.

A prompt step in the execution of the power program should be the establishing of certain standard sizes and types of diesel equipment to be ordered for the new central stations. Such standardization will facilitate securing low costs in design and construction, will simplify the building up of a force of properly-trained station operators, and will greatly improve service and reduce maintenance costs by making possible the carrying of complete stocks of repair and replacement parts. Suggested approximate sizes for such standards are 500 kw, 1,000 kw, 2,000 kw, and 3,000 kw. A temporary substandard might be 300 kw. Later on intermediate sizes might be ordered provided they use the same cylinder as one of the standards, the variation in size resulting from change

in number of cylinders or in presence or absence of supercharging; such use of intermediate sizes, if used at all, should not be general as it sacrifices some of the advantages of standardization. An important element in this standardization is that orders for a particular size and type of equipment should be limited to not more than two manufacturers, possibly in different countries.

In ordering units for a particular station, as has been discussed earlier, the largest practicable unit size and the smallest practicable number of units should be selected. Even though this may involve some initial over-building or under-building, or some operating hazard due to heavy dependence upon the capacity of one unit, the policy is important for securing eventual economy in power cost.

In the central station program presented later, we have included seven installations for which 300 kw units are indicated, one installation for which 200 kw units are indicated, and also 8,200 kw of aggregate diesel capacity for minor cities for which, if new, the unit sizes presumably would be small. Actually no units smaller than 300 kw should be ordered and the number of new 300 kw units should be held to a minimum. The small units for such installations should to the fullest extent practicable be secured by the process of installing an additional unit at some of the new central stations, thereby releasing an existing small generating station for dismantling and transfer elsewhere. The amounts of money shown in the program, based upon installation of new small sized units, should be sufficient to cover the cost of equivalent kilowatts in large units plus the cost of reconditioning and moving the superseded small units.

It is contemplated that all new diesel engine units of 500 kw or larger will burn heavy fuel oil. This is equivalent to the furnace oil or mazout now distributed for use in steam boilers. The specifications for this oil are satisfactory for larger diesels, and Iranian oil of this grade is used satisfactorily for diesel engines of even smaller sizes in India. The official prices of furnace oil are only from 55 to 60 per cent of the price of gas oil, now almost universally used for diesel engines in Iran, at cities near the railroad, with differentials usually larger in amount although less in per cent at points reached by truck. Heavy fuel oil can probably be used even for 300 kw diesels. In any event new 300 kw diesels and many existing diesels, instead of using expensive gas oil, could use the grade known as diesel oil, which is intermediate between gas oil and heavy fuel oil. This question of fuel type is one of importance. Use of gas oil where heavy fuel oil is appropriate means an unnecessary increase in overall power cost at generating station bus in the order of 10 to 15 per cent.

TECHNICAL FEATURES OF DISTRIBUTION SYSTEMS

The present predominant voltages and types of distribution in Iran are satisfactory —primary 50 cycle, 3-phase 6,000 volts (3 wire), and secondary 3-phase and single-phase 380/220 volts. The few instances of different voltages, or of 2-phase or direct current, should be eliminiated at any location where central station service is being established.

Distribution transformers, primary voltage static capacitors, and other frequently-used distribution equipment should be standardized as to sizes and specifications throughout Iran. Such standardization should result in considerable economy of investment and in greater service reliability.

In all of the principal cities, as new central station service is installed, preparations should be made for use of primary voltage circuits if they are not already in use. All

new generating equipment in sizes larger than 500 kw should be ordered for 6,300 volts, with any 400 volt circuits leading from the generating station served through a stepdown transformer. Units of 500 kw or less may be for 6,300 volts or for 400 volts with a transformer to 6,300 volts, depending upon which is cheaper for the particular situation.

Use of static capacitors installed near the ends of 6,000 volt primary feeder circuits will almost certainly be advisable as soon as feeder loads become of a size approaching their designed capacity. Capacitors increase the effective capacity of the circuits, improve voltage regulation, reduce losses, and are relatively inexpensive. They represent one of the simplest and quickest means of improving service impaired by overloading of distribution systems.

At present it is the usual practice in Iran for all 6,000 volt primary circuits in urban areas to be installed with underground construction. The cost of such construction is probably twice as great as that of installing primary circuits at the tops of poles which also carry secondary or street lighting circuits. Underground construction, except in special circumstances, is not justified by considerations of hazard, service reliability, or appearance. The limited amount of investment funds available can be used more productively by foregoing underground construction as a general practice and building more circuits with the funds so saved. Exceptions to overhead primaries would be in areas where streets are so narrow that the 6,000 volt conductors could be reached from windows or house tops, on streets where there are not, and are not expected to be, either secondary or street lighting poles, and in a few exceptional cases where appearance may be controlling.

In all of the pricipal cities, continuous 24-hour service should be started as soon as any of the new central stations are installed, if it has not been started earlier.

OWNERSHIP AND OPERATION OF CENTRAL STATIONS

One of the most complex and difficult aspects involved in the development of adequate electric power service is the question of the types of agencies which will own, operate, and finance the central stations and the utility distribution systems.

Most of the utility power stations and distribution systems outside of Tehran are owned by private corporations, either small local utility corporations or industrial corporations which sell power as a secondary business. In some cases the municipality owns either the distribution system or both the distribution system and the generating station. In a few cases local power supply is provided by a corporation owned or controlled by the Government.

Fundamentally it does not appear probable that electric power supply can be developed adequately and economically by small enterprises organized on a local scale with their operations confined to one city. At least this seems to be true insofar as power generation is concerned; distribution presents somewhat different and simpler problems. Exceptions may be Tehran and certain remote and isolated small cities.

The tentative suggestion is offered that the business of power supply can be conducted most effectively by having a number of regional Electric Supply Corporations, each responsible for the development, operation, and financing of electric power supply facilities, and in particular of central stations, within a relatively large area. Giving consideration to the eventual possibility of considerable high voltage transmission, the

areas should be so selected as not unnecessarily to separate sections which might become parts of a common transmission network.

Solely to illustrate the conception, and not to be considered as recommendations, such regional Electric Supply Corporations might eventually have service areas somewhat as follows:

Area 1. Caspian coast from Resht to Gurgan.

Area 2. South side of Elborz Mountains, possibly extending as far south as Ghum and Kashan, or possibly combined with Area 1.

Area 3. Azarbaijan.

Area 4. Ostan 5, possibly extending to Ghum and Kashan.

Area 5. Ostans 6 and 7.

Area 6. Ostan 10 and part of Ostan 8.

Area 7. Ostan 9.

Quite possibly a smaller number with wider areas would be preferable.

The main reasons underlying this tentative suggestion are as follows:

1. From the development aspect, electric power cannot be effectively treated on a local basis. Initially and for a long time there probably will be transferring of equipment between stations, such transfers often being best planned long ahead. Gradually there will be transmission interconnections between cities and pooling of power supply. Planning and executing such developments would be far simpler with common control. For development of hydro-electric systems, the regional form of organization seems almost essential.
2. From administration, engineering, and operation aspects, such regional organization would be able to build up and maintain the competent operating force and supervisory and technical staff so essential in the electric industry. On a local scale this would be virtually impossible.
3. The purchasing of equipment and procuring of supplies could probably be done more economically and efficiently.
4. The gradual development of electric service for smaller cities and villages would be greatly expedited.
5. Such regional systems would be large enough, and have enough diversity in their sources of earnings, to simplify and facilitate the raising of investment funds and the securing of loans.
6. The problems of rate regulation would be simplified in many ways.
7. There would be preserved and strengthened the one form of competition possible in the electric supply industry, which by its nature needs to be a local monopoly. This is competition as to the comparative results being achieved among the different regions of the country.

Such regional Electric Supply Corporations might be established initially under the Plan, or they might gradually develop and extend.

The Electric Supply Corporations would be expected in general to build and operate most of the new generation facilities in their respective areas. They might gradually acquire existing generation facilities by purchase or by exchange of securities, as arrangements could be worked out with present owners. They probably would own high voltage transmission facilities when and as such facilities may be constructed. They might in some cases own and operate urban distribution systems, and they might in other

cases sell at wholesale to local distribution systems either municipally- or privately-owned. They would sell power at wholesale to large industries and to irrigation projects. They would maintain interconnections with industrial power stations, and any other power stations not taken over, in the cities and areas where they had central stations. The city of Tehran might purchase power from such a regional system, or it might be self-sustaining but be interconnected with such a system if opportunity for interconnection arose.

The ownership of such regional Electric Supply Corporations might take several forms: (a) they preferably should be privately-owned stock corporations, probably with initial Government loans; (b) they might be semi-co-operatives, with industries and municipalities owning blocks of stock, possibly related in size to the respective power loads; (c) even if the central station industry should temporarily be Government financed and controlled, this regional form of organization would be distinctly advantageous, and later it might simplify the process of transfer to some other form of ownership.

Irrespective of whether or not some such regional form of ownership should be developed, there will need to be some agency, probably a Government agency, with certain powers and responsibilities for regulation of rates and charges for electric service and for requiring the maintenance of proper service. Such regulation should have the dual purpose of:

1. Building up and maintaining financially sound electric utility systems, able to operate efficiently, to expand as needed to meet all growing demands for power, and to secure investment funds on a reasonable basis, which is possible only if the utility system is and continues to be a good and stable investment.
2. Assuring that power requirements are adequately met; that the savings in power costs resulting from larger scale operations and more modern equipment are adequately reflected in progressively lower charges for service; and that there is no improper discrimination in charges for service among different classes of use. As noted earlier, charges to large industries must not exceed the alternative costs to such industries from building and operating their own plants.

The future development of adequate and economical power supply in Iran may be seriously impaired unless these utility regulatory functions are exercised intelligently, competently, and without bias.

RECOMMENDED ELECTRIC POWER PROGRAM

The electric power program which we recommend covers central electric power stations for the 34 principal cities (selected as those understood to be above 25,000 population), certain blanket allowances for generating stations in minor cities, two small mobile power plants for emergency use, and certain special surveys and investigations.

We present no specific program for electric distribution, although we recognize the inevitable need for substantial expenditures in this class of construction. The program does not include certain integral power facilities in industrial plants, which are covered in the industrial reports. It also excludes provision of generating capacity in central stations to provide for irrigation pumping within range of distribution circuits from the central stations, although we recognize that there will probably be a number of stations where an additional generating unit will be needed for irrigation purposes.

The amounts and locations of generating capacity proposed to be installed are summarized below, with details given in Exhibit L-1, and explanatory notes in Appendix L-1.

Central Station Program

Kilowatts

	Existing or Under Way	Proposed Additions		
		Stage 1 1328-1331	Stage 2 1332-1334	Total 7 years
Resht	3,200	2,000	4,000	6,000
Pahlevi	200	600	500	1,100
Kazvin	850	3,000	1,000	4,000
Zenjan	90	600	300	900
Arak	600	2,000	1,000	3,000
Babul, Shahi-Sari-Behshahr	5,000	5,000	5,000	10,000 (s)
Semnan	350	600	300	900
Ghum	1,150	1,500	1,000	2,500
Kashan	2,100	4,000	1,000	5,000
Tabriz	3,200	7,000	6,000	13,000
Ardebil	100	1,000	500	1,500
Rezaiyeh	130	1,500	1,000	2,500
Khoy	—	600	300	900
Maragheh	50	600	500	1,100
Hamadan	1,300	2,000	2,000	4,000
Kermanshah	560	3,000	2,000	5,000
Sanandaj	50	600	300	900
Ahwaz	3,400	—	2,000	2,000
Dizful	50	1,000	500	1,500
Burujird	150	2,500	500	3,000
Shushtar	550	500	500	1,000
Shiraz	1,500	9,000	3,000	12,000
Kazerun	—	400	200	600
Bushire	400	1,000	500	1,500
Kerman	1,420	4,200	—	4,200 (s)
Meshed	3,300	5,250	5,250	10,500 (s)
Sabzavar	210	500	500	1,000
Nishabur	120	500	500	1,000
Ghuchan	—	500	500	1,000
Isfahan	18,550	—	6,000	6,000
Yezd	2,100	4,000	2,000	6,000
Najaf-abad	50	600	300	900
	50,730	65,550	48,950	114,500
Tehran	23,000	31,500	63,000	94,500 (s)
Total 34 Cities	73,730	97,050	111,950	209,000
Minor Cities	—	3,280	4,920	8,200
Total Program	—	100,330	116,870	217,200

(s) Steam—total 119,200 kw; remainder diesel—total 98,000 kw.

The specific amounts of generating capacity designated for each location are necessarily tentative since the location of various large power-using industrial projects is tentative, and also since the shifting trends of population migration and growth of small industries can make, over seven years, substantial variations in power requirements at specific cities without great effect in the aggregate requirements. The total program of 217,200 kw represents an appraisal of the aggregate needs as at present foreseen on the general assumption that the Seven Year Plan proceeds successfully at the overall rate now planned. Slower progress in other phases of the Plan would mean, directly and indirectly, slower growth in electric power requirements, with consequent probable slowing down in the electric power program.

The amounts of generating capacity shown as existing or under way include, as to the principal cities, that portion of presently existing generation facilities, both utility and industrial, which is considered possible or worth while to rehabilitate and likely to be retained in service, and the new generating capacity believed to be actually in process of construction or covered by firm orders for equipment. Much uncertainty attaches to the estimates of what is covered by "firm orders".

The estimated cost of this program for generating stations is shown in the following table, together with the portion of the cost for which we suggest that aid will be received from the Plan.

Cost of Central Station Program

	In Thousands of Rials			
Ostan	Total Cost Station Program	Part Without Plan Aid	Part With Plan Aid	Percent Aid
1	157,540	52,220	105,320	67
2	243,610	95,210	148,400	61
3	144,170	46,510	97,660	68
4	59,500	23,470	36,030	61
5	107,790	37,800	69,990	65
6	96,430	32,250	64,180	67
7	144,980	43,360	101,620	70
8	75,690	33,560	42,130	56
9	169,480	76,310	93,170	55
10	137,140	41,960	95,180	69
Ostans	1,336,330	482,650	853,680	64
Tehran	726,000	582,810	143,190	20
Total	2,062,330	1,065,460	996,870	48

Details of the estimates of the cost and of the proposed extent of aid from the Plan are shown Exhibit L-1. The estimates of cost are intended to allow for a reasonable amount of contingencies. They include allowances, about three per cent of the total cost, for acquisition of generating station sites and provision of access roads and streets.

The table below shows our suggestions as to the proportion of the total program costs which should be provided from the Plan. All allocations of aid are for foreign exchange.

Suggested Aid from Plan Organization

Type of Electric Power Use Upon Which Aid is Allocated	In Thousands of Rials: Total Cost of Program	Foreign Exchange Required	Suggested Plan Aid for Foreign Exchange: %	Suggested Plan Aid for Foreign Exchange: Rials
Total cost of station program	2,062,330	1,372,340		
Portion of cost applicable to:				
Industrial use in ostan areas	854,500	587,140	100	587,140
General public in ostan areas	481,830	333,200	80	266,540
Total for Ostans	1,336,330	920,340		853,680
Industrial use in Tehran area	383,090	238,650	60	143,190
General public in Tehran area	342,910	213,350	0	—
Total for Tehran	726,000	452,000		143,190
Total Plan aid				996,870

In the aggregate the proposed amount of Plan assistance is considered to be the minimum amount which, combined with funds from other sources of financing, will make it possible for the recommended electric power program to be carried out. It may be found advisable, after further consideration, to increase the proportion of aid for supplying industrial use in the Tehran area, indicated in the table as 60 per cent of foreign exchange. It is important, in weighing the adequacy of this aid, to give consideration to the large expenditures necessary simultaneously for electric distribution construction. As a rough approximation, distribution facilities for general service to the public will probably average Rls. 15,000 to Rls. 20,000 per kw of generating capacity required, for small industrial users Rls. 12,000 to Rls. 15,000 per kw, and for large power users Rls. 2,000 to Rls. 5,000 per kw. In total this usually means at least as high total expenditures for distribution as for generation. In turn this means that if Plan aid for the ostan areas should be 64 per cent of generating station costs, it would not exceed 32 per cent of total necessary costs, and for Tehran 20 per cent of generating station costs would not exceed 10 per cent of the total necessary costs.

The basing of the allocation for Plan aid on foreign exchange is not intended to constitute a recommendation for a precise formula on this basis. Where aid is to be given for only part of the costs of a group of power projects, there are certain advantages in using a percentage of foreign exchange rather than a smaller percentage of total cost: foreign exchange is easier to check and audit, and this method puts a high premium on economy in Iranian currency expenditures which are a less controllable portion of the costs than the foreign exchange portion. On the other hand, there would be certain drawbacks: extravagance in foreign purchases might be encouraged and proportionately more aid would be given to diesel plants with a high percentage of foreign exchange than to steam plants (or hydro-electric plants later) with a lower percentage of foreign exchange.

Possibly a simpler and more satisfactory aid formula would be merely an amount per kw, about Rls. 7,000 average for the ostan areas, varied up or down somewhat depending upon the proportion of industrial load expected to be served and upon the type of plant involved. Such a formula, with a lower per kw rate for Tehran, could be made to give the same total aid as shown in the proposal above, but it would result in a somewhat different distribution among the respective city projects.

In general summary, the power program outlined above falls into two groups, corresponding to the first and second halves of the Seven Year Plan. In the first half, 1328-1331, the underlying objective has been to provide the additional electric power necessary for new and expanding industrial production of the factory type, to facilitate establishing 24-hour power service in place of part-time service, and to increase the generating capacity available for residential, commercial, municipal, and small industrial uses to an extent sufficient to make possible reasonably satisfactory service for presently established uses of electricity. In the second half, 1332-1334, the objective has been to provide power supply for progressively increasing industrial production, to increase the economy and reliability of service by providing sufficient new generating capacity to enable transferring certain old, small, and inefficient generating units from regular daily operation to reserve and standby status, and to afford enough additional power supply for the general public to enable some degree of progress in extension of service to unwired buildings and some increase in use per customer in the residential, commercial, and small industrial groups.

EFFECT OF HYDRO-ELECTRIC POSSIBILITIES UPON CENTRAL STATION PROGRAM

The central station program summarized above is based entirely upon thermal plants. No transmission lines are included except a small amount in the group project for the Shahi area.

The investigations of hydro-electric possibilities may show that there are certain projects which promise substantial savings in power costs compared with the thermal generating units proposed in this program for the same region, and it might be physically practicable to complete certain of these hydro-electric projects within the seven year period covered by the Plan. The actual construction period for hydro-electric projects of the type discussed earlier would probably be no longer than for steam stations of the same size, although possibly longer than for comparable diesel stations.

It is safe to assume that any hydro-electric project plus the attendant transmission lines would require more investment funds than would equivalent capacity in thermal generating units. Presumably no hydro-electric project would be authorized under the Plan unless it showed estimated savings, in addition to a normal return on the excess investment, sufficient to effect a substantial reduction in power costs compared with the thermal alternative. However, assuming sufficient savings were to be indicated, it is to be expected that the hydro-electric alternative would be substituted.

If such a hydro-electric project were to be adopted, all further permanent thermal plant construction for the area involved should be stopped forthwith. If additional capacity were to be essential before the expected operation date of the hydro-electric plant, it should be secured by diesel units temporarily installed and scheduled to be removed to some other location later.

SPECIAL PROJECTS

Certain special projects are recommended which, while not involving large expenditures, we consider important to the electric power program and hence to such other phases of the Plan as may be dependent upon or aided by electric power.

Pool Order for Diesel Units

We recommend that a pool order be placed promptly by some Government agency for approximately 16,000 kw of diesel generating units without waiting for determination of the specific locations at which the respective units will be installed or for the working out of arrangements with the ultimate owners. Probably nearly two years, even under favorable conditions, will be required from date of ordering diesel equipment to date of initial operation in Iran, possibly a longer time for the larger sizes which are the most urgently needed for new industrial projects. There are numerous specific industrial loads which will require new power installations for their operation. In many cities, for which no new equipment is known to be on order, power shortage is hampering industrial production and is a menace to public safety and health. Prompt placing of this pool order may result in saving six months or more in operation dates, with corresponding speeding up of industrial production. The proposed pool list (shown in Appendix L-2) represents only a small proportion of the units in the respective sizes which are included in the 1328-1331 portion of the central station program, and the Government would not conceivably incur any risk as to the effective utilization of any of the units. No funds are shown as required for this pool order, since the funds are already covered in the central station program. The manufacturing commitment is estimated to be on the order of Rls. 50,000,000.

Mobile Power Plants

We recommend that some Government agency order promptly at least two mobile diesel power plants, with consideration given to ordering as many as four. These proposed plants would be of about 500 kw each, comprising single diesel engine-generator sets permanently mounted in steel railway cars and capable of being operated at any railroad siding through a temporary connection to the local power system.

The ultimate purpose of these mobile plants is primarily for insurance against unscheduled outages of generating units in central stations which may require a long period for repairs. In the interest of ultimate economy and efficiency, the sizes of individual units recommended in the program are often large in proportion to total station capacity during most of the seven year period, and in few if any cases will it be economically or financially practicable to provide adequate reserve capacity in the local plant. The hazard of serious disruption of service for cities along the railroad can be forestalled by these mobile plants. There are 10 to 15 cities along the present railroad lines where such plants might be used, and there will be more as the railroad lines are extended.

A secondary but initially more important function is to provide temporary power supply at cities where there are industrial plants with inadequate power supply for full operation, as for instance at the present time in the textile plant at Behshahr. There are numerous other such cases now, a long period may elapse before all of these situations are remedied, and other cases are likely to arise in the future, especially in view of the fact that most types of industrial plants can be built in less time than the power stations required to supply them.

These proposed mobile plants could probably be shipped within one year and are estimated to cost Rls. 5,000,000 each after allowing for minor expenses in Iran.

As indicated in Appendix L-3, it may be possible to obtain existing mobile plants more quickly, or to get prompt shipment at much lower costs with plants assembled from war surplus equipment.

If the regional Electric Supply Corporations, discussed above, should eventually be established, these two or four mobile plants might later be taken over by some of them.

Diesel Rehabilitation Survey

This survey was recommended in our Interim Report. Details are shown in Appendix L-4. The capacity of the principal existing power sources—diesel engines in industrial and city utility plants—is greatly reduced by long-deferred repairs and rehabilitation. The extended period required for completion of new generating stations makes especially important the prompt regaining of lost capacity in these existing diesel generating units. It is believed that this rehabilitation can be greatly speeded up by the organization of a small but competent staff to supervise and assist in the rehabilitation and in particular to expedite the securing of replacement parts.

Water Power Investigations

These water power investigations are a part of the general investigations recommended in the water resources section (Vol. III). They are referred to here in order to emphasize the desirability of prompt study of certain projects which, if conclusions from the investigations are favorable, may be developed as part of the Seven Year Plan. Details are shown in Appendix L-5.

Electric Distribution Investigations

Upwards of Rls. 2,000,000,000 are indicated as required for new and expanded distribution systems in Iran. Details of suggested procedures and estimated costs are given in Appendix L-6. Except in Tehran and in Isfahan, present distribution systems are rudimentary, and the new program involves in the main not a progressive growth of an established distribution network but a new basic distribution layout. In Tehran the present distribution system was established 12 years ago to accompany a 6,000 kw generating station installation, and no comprehensive plan for the many times larger system of the future has been developed. Only in Isfahan, where new distribution construction is under way, is there any real plan on the basis of which the future facilities are to be laid out and the large prospective expenditures made. Without adequate long-term planning the basic distribution layout and the year-by-year extensions and reinforcements are likely to result in an inadequate system and in wasteful and ineffective expenditures.

While the problems and conditions involved in electric distribution vary widely among the principal cities of Iran, there is so much in common that much time and money can be saved through a joint survey and study to establish basic distribution plans and economical and adequate types and methods of construction. It is recommended that such a survey and study be made, and that it be started as soon as practicable so that costly early errors may be avoided. It would require a small task force, probably from a consulting engineering organization, and a larger staff of Iranian engineers who would be in a position following the study to participate in preparation of detailed working plans and designs for the various cities.

Electric Rate Investigations

The system of rates and charges in effect with an electric supply system is an important factor in determining the effectiveness with which that system can fulfill its public responsibilities, the extent to which customers can make satisfactory and economical use of the service, and the financial stability of the supply system. The electric power supply program proposed involves new elements with important bearing on electric rate principles and methods, such as the policy of larger industries receiving their normal power supply from central stations, the necessity for keeping central station charges within the limits of competitive costs, the need for recognizing the different cost problems involved in primary and secondary service respectively, the provision of new power sources with progressively declining power costs, the inauguration of 24-hour electric service in many communities, and the opportunities for opening up and extending those types of use by customers which result in relatively low power demands at the time of the system peak loads and relatively high use of kilowatt hours during the 24 hours. Many of the new electric rate problems will be common among all of the principal cities, or among those in a certain size group or regional group. Consistency, although not uniformity, of rate policies among the cities has obvious desirability.

We recommend that an investigation be made of the prospective electric service conditions in the principal cities, and a study developed with respect to the types of rate structures and the methods of developing specific rates which will be suitable for the service conditions, will tend to encourage full use of electric service, and will protect the financial stability of the supply system. An outline of the suggested scope and estimated cost of the investigation is given in Appendix L-7. Such an investigation and study would require a small force of foreign consultants and a group of Iranian engineers and specialists who would assist in the work and be in position later to participate in applying the principles and methods developed.

SUMMARY OF ELECTRIC POWER EXPENDITURES UNDER THE PLAN

The electric power program proposed, insofar as it involves aid from the Plan, is summarized in the following table. The distribution of the costs by years is shown in Exhibit L-3.

Projects	In Thousands of Rials		
	Domestic	Foreign Exchange	Total
Aid to central stations:			
For industrial use	—	730,330	730,330
For service to public	—	266,540	266,540
Total stations	—	996,870	996,870
Special projects:			
Four mobile power plants	250	9,750	10,000
Diesel rehabilitation survey	700	400	1,100
Distribution system investigations	1,500	1,300	2,800
Electric rate investigations	1,100	1,140	2,240
Total special	3,550	12,590	16,140
Total Plan aid	3,550	1,009,460	1,013,010

APPENDIX L-1

ELECTRIC POWER REQUIREMENTS OF PRINCIPAL CITIES

GENERAL EXPLANATION

Population

Estimates for 1327 population are based on census figures adjusted for births and deaths to end of 1325 and further adjusted, with assistance of the Economic Advisor to the Plan Administration, for estimated population migration since census dates and for changes to end of 1327. Estimates for 1331 and 1334 are projections made for purposes of this analysis.

Load Estimates

Estimates of consumption per capita and of increasing load factors assume successful progress of the Seven Year Plan with expanding industrial production and gradual upward trend in income and living standards. It is further assumed that 24-hour electric service will supplant part-time service. Estimated distribution losses are possible only with substantial improvement in distribution systems.

Estimated present industrial needs are based upon full operation at normal capacity of existing industrial and railroad establishments in or adjacent to the respective cities, excluding sugar mills. Figures for future industrial loads apply to all industrial and railroad establishments except sugar mills, cement plants outside of Tehran and large chemical plants. They are in part for general industrial growth and in part for specific industrial projects as presently scheduled. Changes in locations for large projects would shift estimated loads between cities.

Irrigation pumping loads to be supplied from city central stations are not included, although it is recognized that at some cities there will be substantial power requirements for irrigation.

Available Generating Capacity

Figures for existing generating capacity represent the estimated capacities after rehabilitation of those units estimated to be retained in operation. Capacity designated as under construction includes both those plants actually in process of construction and those understood to be covered by firm purchase orders. Information as to status of purchase orders was derived from interviews and questionnaires, from records of approvals for official exchange, and from direct inquiries; there is much uncertainty as to status of some of these orders.

Capacity is divided between utility (including municipal) and industrial in most cases on basis of ownership. In some cases industrially-owned capacity has been classified as utility on the assumption that it was in fact reserved or acquired for utility purposes.

New Generating Capacity Needed

These tentative schedules for new capacity, in the interests of ultimate economy, have in general been made on the basis of the largest sizes of units which seemed practicable to use. In some cases an additional unit will probably need to be installed for supply of irrigation pumping, or larger sizes of units used.

The margin of reserve capacity represented by the difference between peak load and total installed capacity is not uniform as among cities. The primary purpose of this

series of individual city estimates is to arrive at a realistic estimate of total new capacity required, not to attempt precise and final estimates for each city. In view of the tentative character of the load estimates, particularly large industrial estimates, and uncertainty as to irrigation, the final program for a city may sometimes be one unit more than shown, or sometimes one unit less.

Cost of New Capacity

Estimates of cost include allowances, approximately three per cent, for acquisition of station sites and for access roads or streets. Costs of similar installations at different cities may vary somewhat, due to different allowances for local freight costs.

Allocation of Cost of New Capacity

Allocation of the cost of new capacity, as between general distribution and large industrial, is based upon their respective peak load proportions of total available and new capacity less their respective amounts of available capacity. As between small industrial and general service to the public, allocation is based on estimated kilowatt hours.

Aid from Plan

The derivation of proposed aid from the Plan, as shown in summary in Exhibit L-2, is based, outside of Tehran, on 80 per cent of foreign exchange requirements for cost of new capacity allocated to general service to public, plus 100 per cent of foreign exchange requirements for cost of new capacity allocated to industrial service. This formula was used as an overall measure of proposed aid from the Plan. It is not intended as a recommendation for a final formula for application to individual cities. The percentage of aid shown varies with the proportion of industrial load for the particular city and also with the proportion of foreign exchange to total cost of the particular plant.

Other Proposed Power Installations Not Included in Electric Power Program

Certain projects recommended in other sections of our report include integral power facilities which are in addition to the installations recommended in the electric power program. Approximate figures for the principal items are as follows:

Type of Plant	Tentative Location	Generating Capacity
Sugar program		
Beet sugar, 700 tons	Rezaiyeh	1,680 kw
Beet sugar, 700 tons	Turbat-i-Haidari	1,680 kw
Beet sugar, added	Marv-dasht	560 kw
Cane sugar, 4 plants	Khuzistan	4,480 kw
Cement program		
200 ton plant	Dizful area	2,000 kw
Four 200 ton plants	Uncertain	8,000 kw
Chemical program		
Ammonium sulfate	Agha-jari	1,500 kw
Total above 13 plants		19,900 kw

In addition to these 13 installations there are uncertain amounts of power capacity for water pumping not adjacent to cities and various minor installations.

In case any of the new cement plants should not make use of waste heat boilers, their power requirements should be supplied not by integral generating facilities but by the central station for the area.

Appendix L-1

APPENDIX L-2

POOL ORDER FOR DIESEL UNITS

The number and the capacity of diesel units of various sizes proposed to be covered by a prompt initial pool order is shown in the following tabulation, together with a comparison with the units scheduled in the 1328-1331 portion of the central station program for principal cities.

Proposed Pool Order			1328-1331 Program		
Number	Size	Capacity	Number	Size	Capacity
	kw	kw		kw	kw
—	—	—	2	200	400
2	300	600	14	300	4,200
7	500	3,500	21	500	10,500
6	1,000	6,000	14	1,000	14,000
3	2,000	6,000	8	2,000	16,000
—	—	—	2	3,000	6,000
18	—	16,100	61	—	51,100

It is expected that many of the requirements for which new 300 kw units are listed in the central station program can be met with diesel units displaced from existing stations. However, there will inevitably be some urgent situations requiring new 300 kw units. 500 kw units are scheduled for use in the 1328-1331 programs for 10 cities; 1,000 kw units for Kazvin, Kashan, Arak, Hamadan and Kermanshah; 2,000 kw units for Tabriz, Resht, Shiraz and Yezd.

For the initial order, 300 kw and 500 kw units should be ordered for 400/230 volts, 1,000 kw and 2,000 kw units for 6,300 volts (These are the nominal station voltages; rated voltages of units may be higher).

For this relatively small pool order, all of the units in each size class should preferably be ordered from the same manufacturer.

APPENDIX L-3

MOBILE POWER PLANTS

A considerable number of railway mounted diesel power plants were made in the United States during the war for general emergency use, particularly at overseas locations. Since the war ten such units of 1,000 kw each have been made for use in Mexico, and there may have been others.

The two portable power plants proposed for Iran, if built as new equipment throughout, would consist of 500 kw medium high-speed diesel sets built into steel cars on railway mounts capable of operation from any railroad siding. The generators would be 400/230 volts and there would be an accompanying transformer 400/6,300 volts. The estimated cost of such mobile plants, with transformers and spare parts, is estimated as $150,000 each delivered to Iran, and it is believed that shipment could be made within one year from order.

It is understood that the U. S. Navy has in storage eight such plants, all unused, with 600 kw 50 cycle units mounted in specially built cars with best grade of equipment and material. Dimensions are safe for Iranian railroad tunnels. These plants have not been declared surplus, and it is understood that the Navy is about to convert them to 60 cycle equipment for emergency use in the United States. It is a possibility that some of the plants might be secured for Iran if prompt overtures were made. The price in such event is unknown, but it might be less per kw than the estimate given above for new 500 kw plants.

As another possibility, there is understood to be still available in the hands of contractors in the United States a limited amount of war surplus equipment suitable for making such mobile power plants, some unused and some reconditioned, including engines, generators, certain auxiliaries and steel troop cars. The equipment should be satisfactory, if it passes careful inspection, particularly since engine speeds would be reduced. Probable size of plants with the equipment available would be 600 kw, cost per kw might be little more than half of new construction, and deliveries should be prompt.

APPENDIX L-4

DIESEL REHABILITATION SURVEY

As was set forth in our Interim Report, it is recommended that a small but competent staff be organized to supervise and assist in the rehabilitation of diesel engines used for electric generation in utility and industrial plants throughout Iran, and in particular to expedite the securing of replacement parts.

The work to be done and the functions of the staff would be as follows:

1. Visit all diesel engine installations of important size in Iran (other than those of the AIOC), determine which diesel generation units are worth rehabilitation and which are not, determine and list the replacement parts required, ascertain the status of orders already placed for replacement parts.

2. Assemble in Tehran lists of parts required from each engine manufacturer, and parts presumed already to have been ordered.

3. Arrange for placing pool orders with each manufacturer and for checking with each manufacturer the status of orders presumed already to have been placed, and arrange for following and expediting of all orders.

4. At time of visits to plants, advise plant operators with respect to best methods of carrying out repairs and with respect to possible improvements in plant operation. Subsequently give such further advice and recommendations as may be helpful in improving plant performance.

5. Prepare correct inventories of installed power facilities in each plant, of present effective capability, and of capability after rehabilitation. Collect such other data with respect to the plants and their performance as the Government agencies may need.

6. Staff should submit recommendations as the measures for assuring proper operation and maintenance of new installations.

7. Operators of the power plants should be invited to avail themselves of participation in the pooled orders, but should not be required to do so. Owners of the plants would be responsible for payment for the parts ordered for their account.

The estimated duration of this work is three to four months, and the estimated cost is Rls. 400,000 for foreign exchange requirements plus Rls. 700,000 to be expended in Iran, a total of Rls. 1,100,000.

APPENDIX L-5

WATER POWER INVESTIGATIONS

As a part of the investigations covered in the water resources section (Vol. III), there are included investigations of relatively high head developments for electric power only. Outlined below, in more detail, are certain aspects of the investigations and certain particular locations which are of immediate interest in connection with the earlier stages of the electric power program.

EARLY INVESTIGATIONS NEEDED

Investigations needed to enable decision as to whether a particular site should be scheduled for prompt construction, in place of further installations of thermal units, include the following points:

1. Minimum stream flow and duration of relatively low flow, including correlation between short period measurements on the particular stream and such longer period records as are available with respect to rainfall and stream flow in other rivers.

2. Stream profile, length of river section with gradient worth developing, and hydraulic head which may be utilized.

3. Is it cheaper per kw to develop the usable hydraulic head in more than one stage, or, if not cheaper, is it economically practicable?

4. Selection of intake site, conditions for construction of diversion works and of pond to be used during dry season for daily regulation of stream flow (the small dam involved should have large gate area, and gates would normally be opened during high water conditions to avoid silt accumulation).

5. As an alternative can the regulating pond be located at some point along the pipe line or tunnel closer to the power plant, thus enabling smaller diameter pipe line or tunnel above the pond?

6. Conditions along one side of the valley for pipe line construction. Protection from snow slides and rock slides.

7. Alternatively in case of larger streams conditions for tunnel construction from the intake to a point near the power plant.

8. Selection of power plant site, with particular consideration to securing short length of the heavy steel penstock required between end of pipe line or tunnel and the power plant. Can penstocks be shortened economically by excavating a long tail race?

9. Problems of constructing access roads and trails.

LOCATIONS TO BE EXPLORED

Usually if a favorable decision as to a specific hydro development is to be reached at all, the sooner it is reached the greater the savings in power cost, since there will be less new thermal power installation to be supplanted.

The following sites are of particular interest from the aspect of promptness in investigation.

Haraz River to serve Tehran.

Several streams near Shahi.

Small streams west or southwest of Resht to serve Resht and Pahlevi, and alternatively Pul-i-rud to serve whole Resht area.

River near Rezaiyeh.

Other possibilities for small developments in the near future include:

Mountain streams north of Maragheh.

Mountain streams south and southeast of Tabriz.

Bolaghil Chai southwest of Ardebil.

Sardab Rud southwest of Chalus to serve Chalus and Noshahr instead of replacing present Chalus steam equipment.

Stream north of Turbat-i-Haidari.

A possible project of considerable size would be a section of the Talaghan east of Kazvin, but this situation is complicated by the possible eventual diversion of the Talaghan for irrigation use south of the Elborz Mountains.

In investigations of the streams along the northside of the Elborz Mountains there should be kept in mind the eventual possibility of a high voltage transmission line from Resht to Gorgan with a number of small hydro-electric plants feeding into it at intervals and the cities along the Caspian coast drawing their power supply from it.

APPENDIX L-6

ELECTRIC DISTRIBUTION INVESTIGATIONS

The investigations and studies recommended with respect to electric distribution systems would comprise generally the working out of basic principles and methods and of typical general layouts for primary voltage distribution circuits and facilities, and of principles and methods for secondary voltage circuits and facilities. They would also cover determination of the respective fields of overhead and underground construction, standards for distribution equipment, and methods and materials of construction. Detailed working plans for construction in individual cities would not be included.

The work would involve investigation of electric distribution conditions and prospective developments in Tehran, where two primary voltage systems are involved, in several other of the larger cities, and in a number of typical smaller cities in different regions of Iran. The general primary layouts developed for these cities and the principles and methods developed for both primary and secondary circuits could then be used in later preparation of detailed working plans in these and other cities.

The investigations might include, as an incidental subject in co-operation with forestry studies, the possibility of opening forest areas where timber of proper size and type might be secured for making into impregnated wood poles of the longer and heavier distribution sizes. If such timber exists and can be reached at reasonable cost in the northeast Caspian area, the poles could be impregnated at the railroad treating plant and distributed to many cities, replacing in part the use of reinforced concrete poles or imported poles, which are expensive, and of small poplar poles which are inadequate even for most secondary circuits.

The staff required would include a small task force of foreign engineers, probably from a consulting engineering organization, and a larger staff of Iranian engineers. An important aspect of the studies would lie in their being made jointly by the foreign and Iranian engineers, and in the consequent acquisition by the Iranian engineers of experience which would assist them in participating later in preparation of detailed working plans and designs for the particular cities studied and also for other cities.

The work would probably cover four to six months and the estimated cost is the equivalent of $40,000 in foreign currencies (Rls. 1,300,000) plus Rls. 1,500,000 in Iranian currency, a total of Rls. 2,800,000.

APPENDIX L-7

ELECTRIC RATE INVESTIGATIONS

The investigations and studies recommended with respect to electric rates would comprise generally an analysis of the types of rate structures suitable for the several classes of cities in Iran and of the principles and methods for determining specific rates for specific cities. The investigations should cover prospective conditions and costs of electric service in most of the larger cities, including Tehran, and in a number of typical principal cities of smaller size.

The investigations and studies should include such aspects of electric rates as (a) the extent to which demand charges would be used and how demands would be determined, (b) the use of blocks or steps in energy charges and the relative magnitude of charges for initial and subsequent steps or blocks in a consumer's bill, (c) the relative forms and magnitude of charges for short direct feed and for primary and secondary distribution service respectively, (d) the need or lack of need for different rates for different classes of secondary use, (e) the methods of metering and meter reading to be adopted, and (f) the policy, temporary or permanent, of requiring the consumer to pay for meters and for service connections to the distribution system. There should be co-operation with the studies of electric distribution systems in respect of various matters, including types of metering and in particular the use of two element watt-hour meters which keep separate records of electric use during different periods of the day, a type of metering now in extensive use in Tehran.

As in the case of the electric distribution investigations and studies, there would be required a small task force of foreign consultants working along with a larger group of Iranian engineers and specialists. This co-operative work is an important aspect of the studies, since the Iranian engineers and specialists would then be in position to participate effectively in applying the rate types, principles and methods to formulation of specific rate schedules for various cities.

The work would probably cover less than six months and the estimated cost is the equivalent of $35,000 in foreign currencies (Rls. 1,140,000) plus Rls. 1,100,000 in Iranian currency, a total of Rls. 2,240,000.

The purpose of these electric rate studies is not to serve as a basis for regulatory policy or action. It is to develop rates which will be sound and adequate from the aspect of the electric supply system, will be suited to the service conditions and will tend to encourage diversified and economical use of electric service. It would, of course, follow that future rate regulatory procedures would be aided by the establishment of sound and relatively consistent forms of rates throughout the various cities.

PETROLEUM

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PETROLEUM

INTRODUCTION

National policy concerning petroleum exploration and development in Iran has been expressed in the Seven Year Plan law by the provision made for the formation of a Government-owned oil company and the broad definition of its purposes. The political and other reasons which led to such a policy can be surmised from the oil history of the country, which is summarized in the discussion of existing conditions. In this report we do not examine the political aspects of the national oil policy, but it is necessary that we bear the main circumstances in mind in order that our recommendations remain consistent with the controlling policy while at the same time leading to a sound and practicable program.

Generally speaking, there are three sets of factors which must be held in view and reconciled in the best way possible in formulating a program of oil exploration and development for Iran. The first is the national policy already mentioned. This must be accepted as arbitrarily imposed, although the possibility of its modification as circumstances change must also be recognized. The second consists of certain principles drawn from world experience in oil development. Insofar as these are relevant to Iran's case, we should profit by them without obliging Iran to learn them anew, possibly at great cost. The third group of factors consists of the actual conditions which exist in Iran, to which the principles just referred to and the modern techniques of the oil industry must be applied in order to assure a successful outcome of the program.

The general principles will be discussed briefly first, then the existing conditions will be described and finally conclusions will be drawn and recommendations made as to the program itself.

GENERAL PRINCIPLES

The outstanding characteristic of the search for oil is risk, from both the technical and the economic viewpoints. The development of most of the earth's hidden riches, for example gold, manganese or coal, begins with the discovery of an exposed outcrop, and while even then the risks encountered in mining ventures are proverbially high, they are minor compared to those faced by the oil prospector.

Unlike the outcrops which signal the existence of an ore body, even though its richness and extent may be determined only by expensive work, the earth's reservoirs of oil are concealed, typically, beneath a mile of subsequent geological formations which represent millions of years of sedimentary deposition and complex folding, faulting, and metamorphic changes which leave it possible only to deduce from surface evidence what lies beneath. Characteristically, this surface is now covered by forest, jungle or desert waste, and its visible form is merely the transient result of erosion by water and wind. The most painstaking work of the geologist, supplemented by modern scientific techniques of geophysics, can do no more than produce conjectures as to the folding or other stratigraphical conditions a mile beneath the surface which might have served to trap the oil, if millions of years ago there were any there to trap.

But oil is actually discovered only by the drill. At this stage, the technical risk becomes also an economic risk. A single well drilled for the initial test of a new region

may cost a million dollars, and can as easily cost more as less. All the risks of wrong deductions which perplex the geologist's scientific reasoning become, to the investor, risks to the fortune which proof of the answer entails. It is only after both these risks have been taken and the gamble won that the undertaking proceeds to the normal risks of business which arise out of errors in managing or technical judgment, conditions of the market and economic or political situations which no one can foretell.

If the risks in oil development are so high, the question may be asked, how is it that so many fields have been discovered, and not only by the companies with vast resources but by individuals as well?

The answer is not difficult. First, little is told of the fortunes lost or the dry holes drilled. Practically all the important oil regions of the world have been discovered and developed initially by the major oil companies, through the efforts of large and highly trained organizations and with the expenditure of hundreds of millions of dollars. It is after these initial developments, typically, that the smaller operators come into the scene. In this later stage their contribution has been substantial, adding hundreds of millions of new capital to that first risked in establishing the basic conditions.

Viewing the oil industry as a whole, the "risk capital" which pays for new explorations can be regarded as a revolving fund maintained by a fractional part of the price charged to every consumer for gasoline or other products. This "depletion fund", enormous in its total, is available for meeting the costs of searching for new sources of oil in the jungles, mountain regions, and deserts of every country in the world—and without risk or cost to that country. It is the consumer who pays this bill, as an essential part of the cost of maintaining the world's supply of oil. To pass this bill on to the world's consumers, however, it is necessary to become part of the worldwide mechanism through which that collection is made. A prerequisite is sufficient cash resources to meet the costs of the failures which must be sustained between successful ventures. In the long run, this proportion is fixed inexorably by the law of probability corresponding to the current level of exploratory skill. A second prerequisite is sufficient freedom of the world oil market to permit the inclusion in oil prices of the added fraction which distributes the costs of oil discovery over all consumers. During recent years, there has been a marked and increasing tendency among bureaucratic governments to ignore the vital necessity for this depletion fund, both in their income tax and their price fixing operations.

There is, of course, another way to finance oil exploration, whether by a government, a company, or a private person. This is to proceed with a single independent program, paying all costs out of cash on hand and staking the investment on the chance that the program will be successful. Fortunes have been both won and lost on this, as on many other gambles. If circumstances warrant it, as they sometimes do, no risk may be too high to take. Such a situation is usually associated with a desperate need of some kind, with the alternative so serious in any case that an added cash loss is of relatively small importance. For an independent program the capital cost may sometimes be set aside from an ample cash reserve and deliberately risked on the chance of a high return, without hazarding any vital interest. Most cases will fall somewhere between these two extremes, requiring relative risks to be weighed against the chance of gain.

The present case of oil development in Iran by a Government-owned company will, of course, be recognized as pertaining to the second of the two financing methods briefly

described above, namely, an independently-financed program and not one based upon an accumulated depletion fund contributed by oil consumers. In this case, the impelling motive toward independent oil exploration is a political one. The nature of the motive, however, has no bearing upon the actual operating program beyond providing a basis upon which costs and risks can be weighed against the probability of attaining the end in view.

In any such program it is possible to reduce the various risks either to a minimum or to a degree which seems to make the odds acceptable with a particular aim in mind. Risks are of many kinds and the methods of reducing them vary accordingly. Generally speaking, risk begins where certain knowledge ends. To acquire certain information, however, becomes increasingly costly as the knowledge sought becomes more obscure, and a point is reached at which it may be cheaper to work on probabilities than on certainties. The objectives of the program must also be clearly defined; otherwise there is no well-understood basis upon which relative risks can be evaluated in terms of probable success. To make these appraisals in the present case it is necessary to review the conditions existing in the country which are relevant to this problem. After this we shall be able to define the real objectives of the undertaking, and to describe a program which will keep the risks commensurate with the importance of those aims.

EXISTING CONDITIONS

HISTORY OF OIL CONCESSIONS IN IRAN

While the existence of oil seepages and asphalt deposits in Iran has been known since earliest antiquity, little change took place in the use of bituminous products from the times of the earliest written records until the close of the last century. The birth of the modern oil industry, dating from 1859 in the United States, passed unnoticed in Iran, where oil still continued to be collected from seepages and used chiefly as a cementing material as in the days of the early Assyrian Empire.

First Reuter Concession

In 1872 Baron Julius de Reuter, a British subject, was granted a concession by Nair-adin-shah which gave the concessionaire, among other far reaching privileges, "the exclusive right to exploit all mines with the exception of gold, silver, and other precious metals". This concession was nullified 15 months later on the ground of non-performance.

Hotz Concession

In 1884 M. Hotz, a resident of Bushire, obtained an oil concession for a limited area around Daleki. He drilled one shallow well with no results.

Second Reuter Concession

In January 1889 de Reuter obtained a second concession in connection with the creation of the Imperial Bank of Persia. Article 11 of that concession states:

> "The Imperial Bank being ready to make the necessary sacrifices for the development of natural resources and the exploitation of the natural wealth of the country, the Government of Persia grants to the said Bank during the period of the concession the exclusive right in all part of the Empire to exploit iron, copper, lead, manganese, coal, petroleum, borax, and asbestos."

In July of the same year (1889) an annex to the concession was signed, Article 9 of which stipulated that the Bank itself should not carry out the mining works mentioned in the concession but might sell or cede to one or several persons the rights to undertake such works. Pursuant to this arrangement, the Persian Mining Rights Corporation was founded by the Imperial Bank, taking over both the de Reuter and the Hotz concessions. Two wells were drilled, one at Daleki and one at Salakh, without success. In 1899 the corporation renounced its mining rights.

D'Arcy Concession

Meanwhile, a French scientific mission had visited Persia and in 1892 had published a geological report on the oil possibilities in certain regions in the southwest. This report came to the notice of William Knox D'Arcy, a British subject. He was impressed with its contents and sent a representative to Tehran to negotiate. On May 28, 1901, the Government gave D'Arcy a concession, valid for 60 years, granting the exclusive right "to search for, obtain, exploit, render suitable for trade, carry away and sell natural gas, petroleum, asphalt and ozokerite" throughout the whole of the Empire with the exception of the five northern provinces (Azarbaijan, Gulan, Mazandaran, Astrabad, and Khorasan). This concession also accorded to the concessionaire the exclusive right to install pipelines to the Persian Gulf.

Article 4 of this concession provided for the payment to the Government of 16 per cent of the company's profits, plus Rls. 20,000 per year in lieu of taxes.

In December 1902, D'Arcy started drilling operations at Chia Surkh (about 270 miles northwest of the present Masjid-i-Suleiman field). In November 1904 oil was struck by the First Exploitation Oil Company, a subsidiary organized by D'Arcy in May 1903. The production was small and did not warrant a pipeline to the seaboard. Drilling at Mamatain during 1905-1906 produced no results, but on May 26, 1908 oil was struck at Maidan-i-Naftun (now known as Masjid-i-Suleiman) at a depth of 1,180 feet. Shortly afterward, the Bakhtiari Oil Company was created and additional successful wells were drilled in Maidan-i-Naftun.

Anglo-Persian Oil Company

In 1909 the Anglo-Persian (now Anglo-Iranian) Oil Company (AIOC) was formed with a capital of £2,000,000, acquiring the rights of the D'Arcy concession and taking over the First Exploitation Oil Co. and the Bakhtiari Oil Co.

Soon after the formation of the new company, a pipeline with a capacity of 400,000 tons per year was begun from Maidan-i-Naftun to Abadan, where construction commenced on a refinery. In 1911 the pipeline and refinery went into operation.

In May 1914 the British Admiralty entered into a long-term contract with the company for fuel oil supply and simultaneously invested £2,000,000 in shares, thus acquiring a majority interest which it still retains.

During the first World War, production was increased from 354,400 tons in 1914 to 810,800 tons in 1917, and it was over 1,000,000 tons in 1919. By 1937 production had reached 10,000,000 tons and by 1947 had reached 20,000,000 tons.

Average production of the principal fields in December 1947, in barrels per day, was as follows:

Masjid-i-Suleiman	73,000
Naft-i-Shah	3,000
Haft Gel	197,000
Gach-Saran	38,000
Naft Sefid	17,000
Agha Jari	144,000
Pazanun	Shut in
Total	472,000

Abadan Refinery has expanded in keeping with the field production and is today the largest refinery in the world, with an input capacity of 495,000 barrels of crude per day.

1933 Revision of AIOC Concession

In 1933 the Government cancelled the D'Arcy concession, under which the AIOC operated, owing to a dispute over the terms of the arrangement and practices under it. After some months of negotiation, a new concession was granted to the company, valid for 60 years from April 29, 1933. A discussion of the terms of the new concession, which has recently become the subject of negotiations for revision, would be outside the scope of this report. Two important features, however, must be mentioned. The new concession granted in 1933 abolished the exclusive right to construct and operate pipelines to the Persian Gulf, and also reduced the area of the concession to 100,000 square miles. This corresponds to approximately one-sixth the total land area of the nation.

Khoshataria Concession

In 1916 Khoshataria, a Russian subject, obtained an agreement from an official of the Persian Government regarding a concession to explore for and exploit oil in the three northern provinces of Gulan, Mazandaran, and Astrabad. The proposed concession was for 70 years. It included a provision that it would automatically be nullified if operations did not begin within five years from the date upon which the concession was granted.

This proposed concession, however, was never submitted to the Majless for ratification and two years later it was nullified by the Persian Government. Russian claims relating to it eventually were renounced.

Standard Oil Concession

In 1920, on the proposal of the Qavam cabinet, the Majless passed a law (30 Azar 1300) granting a concession over the five northern provinces to "Standard Oil or other independent and reliable American oil companies".

The law stipulated that the concession would be valid for 50 years and that the minimum royalty should be ten per cent of the crude oil. The Government was authorized to negotiate the final terms and submit them to the Majless for ratification. The granting of this concession met opposition from many sources, and after some time negotiations were dropped.

Sinclair Concession

In 1922 Qavam's second cabinet proposed a new law to the Majless providing for a 40- to 50-year concession over Azarbaijan and Khorassan and any two of the three remaining northern provinces (Gulan, Mazandaran, and Astrabad). The law was passed, but after a period of negotiations with Sinclair, it too was dropped.

Kavir Khurian Concession

In 1878 Haji Ali Akbar Amin Maaden had been granted the ownership of the mines in Samnan and Damghan. These included the "oil mines" of Kavir Khurian south of Samnan, where an oil seepage exists. For 40 years no work of any kind was done in the area. As the heirs of Amin Maaden had failed to register their title, the Government refused recognition of their ownership. Official registration eventually was made in 1924. The original owners had meanwhile sold parts of their ownership to a third party and soon found themselves partners with Khoshataria and later with the Russian Government. Legal difficulties ensued and have not yet been finally cleared up.

In 1929 preliminary negotiations started between the Iranian and Soviet governments concerning the formation of a company under the name Kavir Khurian Joint Stock Oil Company in which Iran was to own one-third and the Soviet two-thirds of the shares. The area proposed for this concession is reported to have been 3,000 square miles in the Kavir Khurian region. While the Kavir Khurian company was formed and a certain amount of exploration work started, legal and other difficulties intervened and the basic agreement between the two governments was never reached. Work was discontinued. The present status of the concession or of rights to it are unsettled.

French Concession

In 1927 under the initiative of the French Government a company was formed under the name Syndicat d'études Franco-Iraniennes and negotiations began with the Soviet Union and Iran with a view to arranging a tripartite collaboration for oil exploration in the Kavir Khurian. These negotiations continued until 1930 without definite result. In 1930 another French company, under the name Société Franco-Iranienne de Recherchés, was substituted and sent its representative to Tehran. This time the negotiations were aimed at a joint French-Iranian venture in Mazandaran and Gulan. According to reports a certain amount of exploration was conducted in Mazandaran during 1930-1931, but the basic negotiations were dropped.

Amiranian Oil Company Concession

On January 17, 1937, the Iranian Government proposed a law granting a concession to the Amiranian Oil Company of Delaware. The area concerned was in north and northeastern Iran, including Gurgan, Khorassan, Sistan, and northeastern Baluchistan (province). The law was ratified February 4, 1937. The concession was for sixty years and gave the company "the exclusive right to search, explore, prospect, and drill for and extract petroleum" within the area of concession. A separate concession conveyed the right to build and operate pipelines to the Persian Gulf.

The company began operations immediately. During 1937 and 1938, extensive reconnaissance surveys were carried out and showed promising results. In June 1938,

however, and despite preparations already made for early test drilling, the company relinquished its concession. The reason publicly given was that "oil of good quality had been discovered nearer to seaports, thus creating a difficult and dangerous situation for capital engaged in exploitation of oil fields far from the ocean." Presumably it was the discovery about this time of large oil fields in Saudi Arabia and other Arab states bordering the Persian Gulf to which this explanation referred.

Dutch Concession

In March 1939 the Majless granted a mining concession to Allgemeene Exploratie Maatschappy covering an area in the central plateau. A clause in this concession stipulated that if the concessionaire in the course of his exploration discovered petroleum, he could enter into negotiations with the Government concerning its development. This concession was nullified by the Government in 1944 on the ground of non-performance.

Observations

Before passing on to the next development, which relates this history of concessions directly to our present problem, some conclusions can be drawn which will have a bearing upon our final recommendations and which may be significant in influencing the future national oil program.

It is clear that the prospect of participating in the development of Iran's oil resources has attracted many substantial foreign groups, some of which, at least, have been prepared to apply large organizations and ample capital resources to the venture. The question naturally arises, why did all these efforts (except AIOC) prove abortive after seemingly favorable initial arrangements had been agreed upon? It is perhaps less important for our present purpose to weigh carefully any of the possible answers which might be given—for precisely the same conditions may not arise again—than to keep the question itself in mind as we formulate plans for future developments. In the past the long-continuing arrangement between Great Britain and Russia concerning the division between themselves of foreign influence in Persia may have been a factor. Other high level international policies may have been involved. Particular interests of the AIOC may have intervened to the disadvantage of other seekers of concessions. (Before the revision of 1933 the monopolistic character of the concession and the exclusive right to build pipelines to the only available sea outlet were certainly such obstacles.) In some cases, both the qualifications and the sincerity of the concession seekers might be questioned. The lack of accord between dominant factions of Government unquestionably produced difficulties when negotiations reached a stage demanding unanimity of Government action. In the case of the larger and more experienced oil companies, it is not unlikely that, whatever the reservations on the Government side, the companies lacked assurance of continuing stability of Government policy. The Government itself, based upon long experience of its own, might easily have viewed all foreign concession seekers with suspicion. Whatever the reasons, it is clear that collaboration between the Government of Iran and foreign oil groups in developing the nation's oil resources has thus far proved uncommonly difficult. No illusions are permissible concerning this fact. As will be shown, more recent developments have aggravated this difficulty although there are indications, on the other hand, that mutually satisfactory arrangements might be worked out to enable valuable collaboration in this important segment of Iran's economy. It is

not likely, however, that any formula drawn with a view toward satisfying uninformed political or public clamor, or toward the self-interests of any foreign company or government, will meet the reasoned requirements which may now be taking form.

DEVELOPMENTS AFFECTING FOREIGN CONCESSIONS

The foregoing summary of oil concessions and negotiations concerning them includes all the cases of importance up to date. Growing out of the historical concern of the Imperial Russian government and the Soviet Union in the northern provinces of Iran, however, and possibly in later years out of other Soviet interests, a situation has developed which cannot be dismissed from our present considerations. This has to do with Soviet efforts to secure an oil concession in northern Iran. For the purposes of this report only a few particulars are relevant.

In 1944, negotiations concerning the grant of an oil concession in Baluchistan (province) were undertaken by British and American oil groups. The Soviet Government at the same time sent its representatives to negotiate an oil concession in northern Iran. The prevailing political situation in Iran was unfavorable for the consummation of any oil concessions with foreigners at the time, and a law (referred to as the "Law of Dr. Mossadegh") was passed 11 Azar 1323 (1944) which forbids Government officials to discuss oil concessions with foreigners.

This law of 11 Azar 1323 was as follows:

"ARTICLE 1. No Prime Minister or Minister or person acting on their behalf, or their deputies, can negotiate with regard to petroleum concessions with an official or non-official representative of a neighboring or a non-neighboring state nor with an oil company or with any other person. Any negotiations carried on will not be considered official and will be without legal effect and no contract signed will be considered valid.

"ARTICLE 2. The Prime Minister or a Minister may negotiate with regard to the sale of petroleum or petroleum products and with regard to the manner in which the Iranian Government administers or exploits the petroleum resources of Iran, but the Majless must be informed of any negotiations carried out.

"ARTICLE 3. Those found guilty of violating Article 1 hereof will be condemned to 3 to 8 years in prison and will be permanently dismissed from Government employment."

As might have been expected after the passage of this law, a period of inactivity ensued. The following year, however, saw critical political developments in Azarbaijan which led to an agreement signed 15 Farvardin 1325 (1945) between Qavam and the Soviet Ambassador Sadchikov. This agreement was concerned primarily with other matters, but it included an agreement (with Qavam) for the formation of an Iranian-Soviet joint stock oil company to undertake all oil developments in the northern regions. When the Majless was next convened, which was not until early in 1947, the Qavam agreement failed to receive approval. On 30 Mehr 1326 (1946) a Single-Article Resolution was passed rejecting the tentative agreement and at the same time indicating the national policy concerning future developments of Iranian oil.

The law of 30 Mehr 1326 was, in part, as follows:

"Note A. Whereas the Prime Minister, acting upon his own interpretation of the law of 11 Azar 1323, has conducted negotiations and arranged an agreement dated 15 Farvardin 1325 concerning the creation of a Soviet-Iranian Oil Company; and

"Whereas the Majless does not consider such interpretation correct;

"The above mentioned negotiations and agreement will be null and void.

"Note B. The Government must prepare instrumentalities for the technical and scientific exploration of the country for petroleum (outside the AIOC concession), and within a period of five years must complete surveys of the oil-bearing areas of the country and maps prepared which will enable the Majless to arrange for the commercial exploitation of the national wealth through the enactment of appropriate laws and with complete knowledge of the quantity of oil available.

"Note C. The granting of any kind of exploitation concession for petroleum or its derivatives to foreigners, and the creation of any kind of company for such a purpose in which foreigners participate in any way, is absolutely forbidden.

"Note D. If, as a result of exploration carried out as provided under B, above, the existence of petroleum in commercial quantities becomes evident in the northern part of Iran, the Government is allowed to negotiate for the sale of petroleum products to the Soviet Union and must inform the Majless of the results of such negotiations.

"Note E. In all matters in which the interests of the Iranian nation in the resources of the country, whether underground or otherwise, have suffered, especially in connection with southern oil, the Government is charged to negotiate and to take necessary remedial steps. The Majless must be informed of the results."

This Resolution has had significant consequences from our present point of view.

Notes A and C have swept the scene clear of foreign participation in oil exploration and development except for the existing AIOC concession and for such residual claims as may exist in connection with the Kavir Khurian concession discussed earlier. The provisions of Notes D and E, concerning, respectively, the possibility of oil marketing negotiations with Russia and the adjustment of differences with AIOC, do not concern us particularly.

Note B places an explicit charge upon the Government regarding the future oil development of the country. Pursuant to this charge, a Petroleum Exploration Division was created, in 1948 (1327), in the Ministry of Finance under the Department of Petroleum, Concessions, and Mines. The new division after a comprehensive review of the situation drafted, late in 1948, a bill for enactment by the Majless. Meanwhile the bill providing for the Seven Year Plan was nearing final form, and finally was enacted. As it contained the provision referred to earlier for the creation of a Government-owned oil company under the jurisdiction of the Plan Organization, the proposed law drafted by the Petroleum Exploration Division was not submitted for action by the Majless.

Because this proposed draft represents an action taken in compliance with a law which is still in effect, however, and for the further reason that it represents a point of

view which will require discussion in connection with our own recommendations, the text (in its preliminary form) is included as Appendix M-1.

While the merits of this proposed draft of law might be appraised more appropriately in connection with our own recommendations, attention will be called here to a few features of this draft.

First, the emphasis it places upon provisions for granting concessions seems to indicate that its sponsors, at least, are prepared to continue the long-established policy of relying largely upon private enterprise for the discovery and development of oil. The proposed provision for admitting foreign participation under certain guarded conditions reinforces our earlier assumption that the rigid restrictions of the Single-Article Resolution of 30 Mehr 1326 (Notes A and C) may in due course be modified, as indeed they would need to be if the proposed law were enacted.

Second, the draft proposes to administer national oil development through a politically-controlled institution, or Bungah, under the Minister of Finance. For reasons given in the section on organization in this report, we do not believe that effective management or execution of so complex and difficult an undertaking is at all likely under such an administration.

Third, the draft as a whole fails to reflect as realistic and practical an understanding as might be hoped of the problems with which it purports to deal. For example, executive authority as well as policy is centered in a committee, the Supreme Petroleum Council, which determines its action by a majority vote. The usual futility of such an executive device is discussed under Committees in the section on organization. Again, it is stipulated that this Council shall be composed in fixed proportions of petroleum engineers and experts in finance, law, and economics. The intention here, to secure men of competence and not mere patronage office holders, is laudable, but the conspicuous need is for men of sound experience in the technical and business affairs of the oil industry. If it should develop that exploration and exploitation are left to qualified private companies, then the stipulation concerning nominal qualifications of Council members is less important. One capable man with wide experience in such affairs would, on the other hand, be highly important in negotiating such concessions. There is no present reason, based upon history, for believing that any responsible and experienced oil company would accept the technical and economic risks that go with the large-scale search for oil if threatened with the added risk—impossible to evaluate—of relinquishing the management of the venture, not only to an inexperienced majority share-holding interest but also to the caprice of a constantly changing political administration with complete control over many of the factors which determine success or failure but without real responsibility for its cost or outcome.

In summary, the proposed draft of law, while touching upon a wide range of points, does not seem to contain the solution to any of Iran's real problems in connection with oil development.

SUMMARY OF GEOLOGICAL CONDITIONS

Physiographically Iran consists of a great central plateau bounded on the north by the Elborz Mountain Range, which toward the east breaks up into subsidiary ranges extending across the Afghan frontier to join the Hindukush, and on the west and south

by the Zagros Mountain System which extends from Kurdistan in the northwest across Pakistan to India. Beyond these two great mountain systems, Iran includes two bordering lowland belts: that fronting on Iraq and following down the coast of the Persian Gulf, and that bordering the southern Caspian Sea. The valley of the Hari and Helmund Rivers forms a third conspicuous lowland area extending into Afghanistan.

Our knowledge of the general geology of Iran is fuller, from the viewpoint of available data for study and correlation, than might be supposed. Regional geological studies have been described in the literature for more than a century. By 1910 many monographs, mostly of an academic character, had been published in Europe. Among these, the works of Loftus, Blanford, and DeMorgan still rank as important contributions. In 1911 Stahl published a comprehensive account of his geological observations in Iran ("Handbuch der Regionalen Geologie," Vol. V.). Pilgrim's reports on the geology of Iran are still cited.

With the discovery of oil in southwest Iran in 1908, fresh impetus was given to geological investigations of economic rather than academic character. From time to time AIOC published accounts of its geological investigations in various parts of the country (over which its original concession extended with the exception of the five northern provinces). Among the modern treatments the account given by DeBolch, Lees, and Richardson in "Structure of Asia" (1929) is notable. Among more recent contributions are A. Riviere's studies in the Elborz and F. G. Clapp's "Geology of Eastern Iran". Many detailed as well as regional studies are reported in various documents forming the available literature pertaining to the various concessions which have been sought in the country. Both academic and economic geological studies continue to be carried on. While a vast amount of information is to be had from all these sources, a great deal of careful and competent correlation is required before much of it will be available for economic application outside of the AIOC concession area. For obvious reasons, much essential detail has been omitted from published reports on economic geology, and much other work will not reveal its full value until its local detail can be correlated with other work to give a broad regional picture. Even without a comprehensive view of the broader picture, however, the detail reported in certain areas provides a good start, and more than a start in some cases, for the purposes of our present study. Such detail will be referred to later when we come to the discussion of apparent oil possibilities in particular areas.

While the pattern and sequence of tectonic movements which gave the country its present form have not been agreed upon throughout, a prevailing opinion explains this as the result of compressive stresses between the Elborz chain on the north and the Zagros on the south and west, with the median mass of the central plateau lying as a relatively resistant block between the two. These stresses have found relief by folding, faulting, and overthrusts which in turn have controlled the sedimentation through successive geologic periods. Volcanic activity has played its part from time to time, and also salt plugs of undetermined geologic age have deformed the strata through which they were thrust. The direction of the overthrust movements in the north-central Iran region was from the north; in east-central Iran, from the west; in the Zagros region, from the northeast, and in the extreme southeast, from the south.

The summary of stratigraphical features following was taken from or based upon published or other readily available sources (compiled largely by the Petroleum Exploration Division) and is presented here merely for convenient reference.

Lower Paleozoics

No exposure of Pre-Cambrian is known in Iran, unless gneissic and schistose rocks in the south usually assigned to Cambrian should prove to be older. Cambrian rocks exist in southwest Iran where their thickness is about 7,000 feet, and in a single other locality in south-central Iran. Ordovician and Silurian are poorly developed in the southwest and unknown in the north and east. Devonian has been reported in the Elborz and in eastern, southeastern, and southern Iran. It lies unconformably over older Palezoics, with a maximum observed thickness of 2,000 feet.

Permo-Carboniferous

Carboniferous limestone is present over considerable areas of the Elborz. A great Carboniferous area appears to underlie more recent rocks throughout the area east of Dasht-i-Kavir. Upper Carboniferous is reported in Bakhtiari and Kuh Gah Kun. Rocks of Permian age are known both in southwest and northwest Iran, and a thick series parallels the coast from the Iran-Iraq frontier to Bandar-Abbass. Permian limestone is reported in the central Elborz and in east-central Iran. The Permo-carboniferous system reaches a thickness of 5,000 feet in several places.

Triassic

Triassic rocks exist in central and eastern Iran and overlie unconformably the Permian. Their thickness is from 2,000 to 3,000 feet. Triassic has been reported also in Azarbaijan.

Jurassic

Jurassic formations exist with a thickness of approximately 10,000 feet in the northeast and in lesser thickness over wide areas from the northern frontier to south-central Iran, and from central Iran to the Afghan frontier. In the northwestern half of the Zagros Mountains it exists with a thickness of from 250 to 1,000 feet. In the remainder or southeast half of the Zagros, Jurassic is present as a component of a continuous thick-bedded limestone formation extending from Triassic to Cretaceous.

Cretaceous

Rocks of Cretaceous age are present throughout Iran. In the extreme northeast, their thickness exceeds 13,000 feet. They outcrop over wide areas north of the Elborz and in numerous places in north, central and southeastern Iran. There are several unconformities within the Cretaceous. A particularly extensive one is noted at the base of the Cretaceous.

From Permian to Cretaceous times the area now occupied by the Zagros Mountains, Persian Gulf, and the Tigris and Euphrates valley formed a deep and sinking geosyncline in which great thicknesses of dominantly calcareous sediments were deposited.

Eocene-Oligocene

The late Cretaceous and early Eocene saw the beginning of a great mountain-building period. Marine Eocene rocks, locally more than 8,000 feet thick, are known north of the Elborz and in several interior basins south of the Elborz. They cover extensive areas in

eastern and southeastern Iran, where their thickness reaches 6,000 feet, and are present over many areas in the Zagros Mountains.

An important volcanic period may have commenced in lower or middle Eocene time and continued through Oligocene and perhaps into Miocene. The eruptions were widely separated geographically. Volcanic Eocene is widespread in the southern foothills of the Elborz and in east-central Iran.

In some areas, especially in the north and east, Eocene overlies unconformably the Cretaceous.

Little is known definitely of Oligocene strata in northern and eastern Iran, and while their distribution may be extensive they have not been differentiated from Eocene. In west and southwest Iran, however, the deposition of Asmari limestone (the reservoir rock of the producing oilfields) took place mainly in Oligocene times. (This rock is described as a fine-grained limestone, sometimes 900 feet thick, carrying anhydrite beds near its base.) The "Khamir Series" found in the southwest is a porous reef development of about 1,200 feet thickness. Asmari limestone has been identified in central Iran, in the vicinity of Ghum and of Kashan.

The so-called "Green Series" which makes the broad frontal portion of the Elborz Mountains is definitely Eocene-Oligocene.

Miocene

Strata of Miocene age occur over extensive areas of Iran. In the southwest, the Miocene has at its base Asmari limestone (mainly Oligocene). The succeeding upper strata are referred to as lower, middle, and upper Fars. (This series is described in various publications by AIOC geologists.) In central Iran, lower Miocene can be identified southwest of Kashan, in the vicinity of Ghum, and in the Dasht-i-Kavir. It exists also along the south side of the Elborz. In a number of desert areas in eastern Iran, great thicknesses of Miocene have been reported. In the Maluman area, 7,000 to 8,000 feet of non-marine gypsiferous Miocene have been reported; and in the region of Samnan, 10,000 feet or more of middle Fars.

On the north side of the Elborz, great thicknesses of Miocene is known in Mazandaran. In northeast Kherrasan, Miocene exists with a thickness of 2,500 feet. The "Makran Series" of the southeast might be the marine equivalent of the gypsiferous series further north.

In the districts of Zenjan and Mianeh, and in the area between Tabriz and Marand, extensive areas of Miocene are reported. In central and eastern Iran Miocene appears unconformably on Eocene and Oligocene. In these regions, the volcanic activity which began in Eocene time disappeared very nearly with lower Miocene transgression, but in the middle Miocene a second period of volcanic activity occurred, accompanied by basic intrusion.

Pliocene

Immense thicknesses of gravel, conglomerate, sandstone, and shale of continental origin are found throughout Iran. These are characteristically steeply folded. The "Bakhtiari Series" in southwest Iran are of this age. The most pronounced folding

movement took place in this period. Fossiliferous Pliocene beds, such as clays, shales, sandstone, and limestone, outcrop prominently in Gurgan province. The exposed thickness is about 300 feet, but greater thicknesses may underlie the Gurgan Plains.

Igneous Rocks

Many kinds of igneous rocks outcrop in north, east, southeast, and central Iran. No igneous rocks exist in the normally folded zone of the Zagros, but are prominent further to the northeast in the zone of great overlaps.

REGIONS OF PROBABLE OIL INTEREST

Without commenting further upon the general geological characteristics of the country, the various regions about which oil interest might be expected to center will be described briefly. There is no intention here to express opinions concerning the probability of oil discovery in any of these areas. For the purpose of formulating a reasonable program, however, it is necessary to recognize the relative favorability of certain parts of the country, based upon available information, and to make a preliminary appraisal of the extent and value of that information.

To begin with, we can eliminate extensive areas of pronounced metamorphism, intense deformation and extensive igneous intrusions and give our attention to the sedimentary areas outside the AIOC concession. For convenience of discussion, eight such regions have been designated, approximately as indicated on the accompanying map, Exhibit M-1. These will be described in turn as a basis for our recommended program of further investigation.

Region 1

This area consists of the long strip bordering the Caspian Sea and the Soviet border, including Gulan and Mazandaran on the west, and the eastern extension of the Elborz Mountain System to the Afghan border. It is considered as a single region because of geological similarity and other aspects common to the entire area. Exclusive of any part of the Caspian Sea itself, the area included is approximately 110,000 square kilometers.

Stratigraphic ages of possible interest in this area include Pliocene, Miocene, Cretaceous, Jurassic, and Carboniferous. Seepages exist in all the foregoing except Jurassic, in which none have been reported in available literature.

A considerable amount of geological work has been done in this area, both reconnaissance and detailed. Much of this is available in usable form, particularly in the Khorrasan portion of the area where competent work was done by Amiranian and other oil company geologists. Geological work by the Soviets during the period of their occupation in the war years is not available, but some conclusions concerning it can be drawn, tentatively, from remaining evidence of their drilling operations. This includes a number of small holes, presumably for structural investigation, and some which suggest efforts at actual production test wells.

Generally speaking, there is much evidence to indicate that this area is a favorable one from the oil geologist's viewpoint. The stratigraphy is suitable, structures of favorable form have been mapped and seepages exist over a wide area. From the operator's

point of view, the extensive plains in part of the region, with little timber or undergrowth, would present no difficulties, but in the mountainous parts the lack of roads and communications would be a severe obstacle. Heavy forest in the central and western part of the region would prevent effective use of photo-geological surveys. From the standpoint of economic importance, the great distance of this region from the southern ports restricts possible outlets to Russia and, of course, the probable increasing demands for oil products in the northern area of Iran itself.

From what we can now see, it seems that the next steps to be taken in this Region should include part or all of the following:

1. A geological map for reconnaissance should be prepared covering at least the coastal plain and the bordering foothills of the Elborz, within Gulan and Mazandaran, and later extended to include the Khorrasan portion of the region. This study would disclose the necessity or importance of geophysical surveys or of structure drilling in the alluvium covered coastal plain and Gurgan Plains. Detailed geological work would follow the indications of the present and supplementary reconnaissance information.
2. Existing structure wells should be cleaned out and surveyed by modern logging methods to get such readily available information as they might supply.
3. The "production" wells should be cleaned out and logged as mentioned under 2.

Region 2

This area is in north-central Iran south of the Elborz and includes the basin marked by the Dasht-i-Kavir. It is approximately 120,000 square kilometers in extent. Within it lies the area embraced by the former Kavir Khurian concession, the status of which is presently uncertain.

Stratigraphic ages of possible interest in this region include Miocene, Cretaceous, and Carboniferous. Seepages exist in the Miocene and Carboniferous.

While a certain amount of preliminary work has been done in parts of this region, particularly in the more readily accessible area to the west, reconnaissance is still required as a first step. While some of the existing detail may prove to be usable, much of it is the result of separate and unco-ordinated studies and will require field checking and correlation. A map of the entire area should be prepared. Photo-geological mapping will probably be justified in large parts of the region. Parts of this region, in the central portion of the Dasht-i-Kavir, have never been visited as far as is known. Preliminary examination should include lithographic and stratigraphic observations as a basis for the reconnaissance field program. There is some evidence of disharmonic folding of Miocene beds which may necessitate geophysical surveying to supplement surface work.

Geologically, this region appears to warrant careful examination. Stratigraphy is favorable, some apparently good structures have been mapped (and inconclusively drilled) and some seepages exist. The western portion presents no unusually difficult operating problems, but in the central and eastern areas the desert and salt swamps of the Dasht-i-Kavir will make transportation and other operations troublesome. Economically, this region, if oil should be developed particularly in the west, would be of high importance in the general development of the rapidly-growing districts around Tehran and Isfahan.

The steps to be taken early in a program for this region might include the following:

1. Existing geological data should be co-ordinated and their dependability established by field checks. A reconnaissance map should be prepared for the entire region, making use of photo-geological methods where advisable.
2. Supplementary detailed work will disclose the necessity for geophysical surveys and for structural or core drilling.

Region 3

This region consists of the relatively small (56,000 square kilometers) coastal area of Makran, representing what might be the extension of the AIOC concession area along the coast to the Pakistan frontier.

Miocene and lower beds exist. While this region has some favorable aspects, the information now available on structure and stratigraphy does not warrant an opinion as to its oil prospects.

The first step here should be a rapid reconnaissance upon which an appraisal of the importance of further work could be based.

From the economic point of view, a source of crude oil here would be important, both for supplying southeastern Iran and for export by sea.

Region 4

This region includes a belt bordering the AIOC concession. As shown on Exhibit M-1, the area is approximately 75,000 square kilometers, although the width of the region is not particularly significant. The most interesting part of it is the strip paralleling in a general way the line of developed oil fields within the AIOC zone.

Stratigraphically this region includes Cretaceous, Jurassic and Triassic beds. Seepages occur in Cretaceous and Triassic.

Considerable careful reconnaissance has been done in the area generally opposite from the line of developed AIOC fields. A question remains as to whether the Mesozoic is oil-bearing in this region. Test drilling now believed to be under way in the adjacent area of the AIOC concession may answer this question.

Economically, the discovery of a large oil source in the general vicinity of present AIOC developments would be of importance, both as a source of oil supply for the region around Isfahan and because of its relatively short distance from the Persian Gulf.

The first work which appears necessary in this region, assuming that the reconnaissance information now available can be accepted as reliable, is to proceed with detailed studies in the areas of high indicated interest. It is reported that AIOC is now drilling deep tests not too far away to illuminate the possibilities of Cretaceous production within this region. Further work within the region should await the co-ordination of the detailed studies suggested with recent developments in the AIOC area.

Region 5

This region includes approximately 120,000 square kilometers west from the Afghan frontier in the Seistan area and extending well into the Dasht-i-Lut.

Stratigraphically the region includes Eocene and Cretaceous, although even the general geology in this area has not been closely studied. The part in the Dasht-i-Lut is completely unexplored.

The first steps in this region would be to establish appropriate topographical controls, and then make a preliminary survey by photo-geology followed by supplementary reconnaissance on the ground. The terrain will present difficulties both in the geological investigation and in any subsequent development operations. Investigation in this region, however, will simplify the study of Region 6, next discussed.

Region 6

This region includes approximately 110,000 square kilometers between Regions 3 and 5, extending west from the Pakistan frontier to the southeastern extremity of the AIOC concession.

Stratigraphically its chief interest is in the Cretaceous which may or may not underlie the outcropping Eocene. The question may be cleared by work done in Regions 3 and 5. The terrain is generally difficult and photo-geology coupled with topographic control would be indicated as a first step in the event that earlier studies in the adjacent regions warranted field work here.

Region 7

This region is the province of Azarbaijan, including approximately 120,000 square kilometers.

Geological information concerning the region is very meager, particularly in the sedimentary areas. (Some studies have been made in connection with copper and other mineral ores.) Near Tabriz and Marand Eocene beds outcrop over a wide area.

Economically, the discovery of even a moderate amount of oil in this region would be of importance, because of the relatively high concentration of population, the trend toward general development within the area and its remoteness from present supplies of oil products.

Exploratory work here must start from the very beginning, with topographic surveying first to provide the basic control. Subsequent steps would in all probability include photo-geology supplemented by ground reconnaissance and geophysical surveys. Structure drilling would doubtless also be required.

Region 8

This region includes such offshore areas in the Persian Gulf and Gulf of Oman as may be determined to come within the jurisdiction of Iran for development, and the islands belonging to Iran not included in the AIOC concession.

This region is included because of the conspicuous interest recently shown in so-called "continental shelf" areas. At present not enough information is available to

warrant any detailed discussion of oil prospects. Developments in this connection may be rapid, however, and Iran's program should include appropriate attention to possibilities in this bordering marine area.

DISTRIBUTION OF OIL PRODUCTS WITHIN IRAN

This subject is treated elsewhere in the report (Vol. V) as part of the general problem of distribution and marketing within the country. All that is intended here is to draw attention to a few facts which have a bearing upon the oil development program.

Petroleum products will undoubtedly play an important part in Iran's program of national development. Extensions to the railroad system and greatly increased traffic will increase the demand for fuel oil throughout that system, and as the equipment is modernized diesel oil will probably be required for new type locomotives. In areas not served by the railroad, improvements and extensions to the road systems and increased movement of both passenger and freight traffic will necessitate ample supplies of motor fuel, both gasoline and diesel oil. Municipal and industrial power plants, even with full economic use of power from hydro-electric and coal-burning stations, will demand low-cost fuel, which may be fuel oil, diesel oil or natural gas. Increased passenger traffic on the civil aviation routes of the country will be the logical answer to the long distances and new demands for rapid communication which accompany general economic development, and aviation grades of gasoline must be readily available. Many industrial and other special oils, including lubricants and solvents, will be in demand.

One other rather special need for a low-priced and widely-distributed heating oil, such as a low-grade kerosene or a light furnace oil, warrants particular mention. Such an oil, with very low-priced burner and heating equipment to serve the diverse needs of the public throughout the cities and provinces, is highly important as a substitute for other fuels now used. The devastation of forests for the production of charcoal is discussed elsewhere in this report, as is also the destruction of plant cover on the windswept plains and the use of manure as fuel instead of as much-needed fertilizer.

The increasing importance of petroleum products throughout the country is recognized in the note which forms an annex to the Seven Year Plan law, and the local utilization of oil which might be discovered in the various regions of the country is advanced as one of the arguments supporting the proposed national oil company.

Recognition has been given to the importance of abundant and low-priced oil products in the general attention which has been given to the delivery by pipeline of oil and gas from the present fields in the south to the more densely populated areas north of the Zagros Mountains. Pipeline distribution of both oil and gas will certainly become a part of Iran's economic program. The economics of such distribution from existing and possible new oil fields must be studied continuously in relation to the progressing programs for industrial development, municipal improvement and growing transportation systems of the country. In the present stage of the program it is impossible to evaluate any particular system of long distance pipeline transportation of oil or gas. The availability of these important sources of heat and power is a critically important factor in determining many other parts of the long-range program. Studies of such pipeline systems, therefore, both from existing sources of supply and tentatively from other probable or possible sources, should be begun at once and maintained in parallel with studies of other projects which are dependent upon the availability and cost of fuel in large quantities.

For our present purpose, which is to formulate a program for the sound development of the oil industry itself in Iran, it is only necessary to review the foregoing summary of oil demand, and to point out that the existing system of distribution within the country is deplorably inadequate. The inadequacy is not only in the physical means, which reflect other basic inadequacies such as poor roads or no roads at all, insufficient motor transport equipment and maintenance facilities and inefficient railroad operation, but extends to many other factors which affect the price of oil products. It is enough here to mention that despite the vital importance of kerosene as a substitute fuel to avoid the destructive use of forest timber, plant cover and manure, taxes account for about 44 per cent of the retail selling price, and transportation about 43 per cent, a total of about 87 per cent of the price paid by the consumer. The remainder is divided between marketing costs, profits and the base cost of the product at the refinery. It is obvious where attention is first needed to make this product reasonably available to the consumer. This conclusion applies also to other oil products.

PRESENT ORGANIZATION FOR DEALING WITH OIL PROBLEMS

Within the Government all matters pertaining to oil come under the Minister of Finance. The Department of Petroleum, Concessions and Mines deals with the entire range of problems arising out of concessions of all types, including oil. Until very recently attention in this field, as far as oil is concerned, was limited to the conspicuously important matter of dealing with the AIOC. For this purpose a small staff is maintained in the central office in Tehran, with a technical and auditing section in Abadan and a Government representative in London. In 1948, as mentioned earlier in this chapter, a Petroleum Exploration Division was established under the Department of Petroleum, Concessions and Mines for the purpose of implementing Note B of the Single-Article Resolution of 30 Mehr 1326. As described earlier, a more complete organization was contemplated under the proposed Petroleum Law and the Bungah Naft, but is now in abeyance pending developments under the Seven Year Plan law. At the present time, therefore, except for the presence in the Government service of a few men with high technical educational qualifications, we can consider that whatever organization is required to deal with Iran's national oil development problems must be an entirely new one.

PROPOSED PROGRAM

OBJECTIVES OF THE PROGRAM

In the Introduction to this section it was pointed out that the objectives of the national oil development program must be clearly understood before we could judge the degree of risk which it is prudent to accept in terms of capital devoted to the search for oil. Certain principles were discussed as a guide to judgment in this connection.

With these principles in mind we should be able to look at the conditions which actually exist and draw sound conclusions as to what our real objectives are. Having done this, to describe a program which should achieve our aims, and the agencies and organization necessary to put that program into effect, will not be difficult.

First, the basic facts which characterize the present situation can be summarized as follows: Present oil fields (AIOC) are in the southwestern region of the country,

with a high mountain range and considerable distance separating them from the densely populated and potential industrial areas. Existing geological information, while incomplete, suggests that commercially important oil fields might be found in various other regions, some of them close to important centers of population. Prevailing national policies make it impossible to open these areas for exploration and development by foreign oil companies. Within the country there are no qualified private companies nor adequate private sources of risk capital to undertake such development. The current economic program (Seven Year Plan) will require that substantial new sources of wealth be exploited as a basis for a higher and rising standard of living within the country. In these circumstances the possibility of developing new oil wealth must not be overlooked; indeed, there is reason to believe that oil may be the country's greatest natural resource. The only practicable way to initiate such new development at the present time is by creating a Government agency for the purpose.

None of the factors which might decide a speculator to embark upon a high risk ("wildcat") venture are present in this case. Iran has already within the country one of the largest oil operations in the world. It has been highly successful and provides the country with a reliable flow of foreign exchange revenue as well as other benefits. While promptly increased revenue is important, there is greater assurance of gaining it through practical and equitable dealings with the present concessionaire than of gaining it from new discoveries and developments of oil elsewhere in the country.

In Iran today there is no substantial fund of "risk capital" which could justifiably be ventured in the hope of high gain. On the contrary, Iran is now undertaking a vast program of social and economic improvement which will require the full resources of the nation, and perhaps substantial foreign loans, in order to achieve its aims. Private risk capital, on the scale required for oil development, is non-existent within the country, and private resources will be strained to the utmost to meet the normal investment requirements of the country. Even though a substantial amount of Government capital has been made nominally available for the purpose of oil exploration, the "right" which a private person enjoys to gamble with surplus capital of his own does not exist in the trusteeship over public funds which prevails in the present case. On the contrary, for a public official to take unnecessary risks with vitally-needed public funds would be to exhibit inexcusable irresponsibility. The funds nominally allotted to this purpose in the Seven Year Plan law are not in fact presently available, and when it becomes available all money spent in the search for oil must be regarded as taken from other projects of the Plan.

Prompt results in new oil development are not a pressing requirement. There can be no reasonable expectation that the early part of the Seven Year Plan can be financed by new oil discoveries. To expect this would be unrealistic in the clear light of much experience. The real benefits of such a new discovery may be very great, but must be regarded as belonging to the later phases of the Plan and not to the early phases. Even when an oil field has been discovered, which means that at least one successful test well must have been drilled, subsequent drilling for production and the works necessary for refining, pipeline transportation, storage, etc., would require several years to complete to a point enabling any susbstantial benefits to be realized.

While it is deplorably true that most of Iran's population today is inadequately supplied with oil products and that this situation promises rapidly to become worse, the only course which can result in correction or marked improvement as rapidly as will be

required is to go to work at once on the transportation and distribution of oil from present sources, and on the tax and other pricing factors which are independent of the sources of supply.

The circumstances discussed in the foregoing paragraphs do not mean that Iran should not proceed with a search for additional oil resources within the country, but they do remove the urgency for prompt discoveries which, in other circumstances, might warrant a program of high cost and high risk. This conclusion is an important one, as the degree to which risk can be reduced depends very largely upon the time available for investigations in advance of costly physical operations. It is assumed, of course, that this time will be utilized effectively.

There are two types of risk which concern us chiefly in oil exploration and development. The first is the risk that begins where our knowledge of underground conditions ends. This can be reduced by extending that knowledge. The second is the risk of blunders by the personnel engaged on the work. This can be reduced by utilizing skill previously gained on similar work elsewhere and relieving Iran's operations from the burden of paying the full price of first experience. A single blunder or error in judgment in locating a well, or in directing the intricate process of drilling and equipping it, can easily result in losing the investment or in doubling its cost.

To extend knowledge as a means of reducing risk means that intensive geological investigations should be completed before drilling begins. Drilling, while ultimately necessary to discover oil, represents the heaviest financial risk in the undertaking. It is not the drilling alone, which itself is costly, that makes this so, but all the auxiliary facilities and services which must be provided in preparation for a drilling operation and to maintain that operation for many months, particularly in an isolated region. The further one can go toward eliminating areas in which the probability of discovering oil is slight, the less the probability of utterly wasting drilling operations which fail to disclose the presence of oil. The further one can go toward locating the areas in which the probability of oil is high, the greater the chance that drilling investment will be worth while. Moreover, information gained in one region of the country may be vastly important in interpreting observations made elsewhere. It is necessary, therefore, that the maximum information accessible through relatively inexpensive means be secured before risking capital on the costly final test by drilling.

The truisms just mentioned may be dismissed by some as superfluous in this discussion. It is extraordinary, nevertheless, how often they are overlooked in oil development practice except by those who have a high personal interest at stake.

Every available item of relevant information should be secured and analyzed before undertaking new work covering the same field. Much geological work and some drilling has already been done within Iran. This has been done by many different men and will require close analysis and expert correlation before it discloses all the information which can be drawn from it. Field checks will be required in order to assess its reliability. In most cases time and skill spent on the study of competent existing reports, and classifying the data for convenient use, will produce valuable information more rapidly and at less cost than by repeating the field work upon which they were based.

New field work should be planned comprehensively in advance, commencing with general reconnaissance and narrowing to detailed examinations in favorable locations. Relatively inexpensive aids to surface geological work should be employed where time or

money saving warrant them. These include such practices as shallow structure holes or photo-geological reconnaissance where the terrain is difficult. More costly methods, including various geophysical techniques, should be deferred until their justification is established and the total areas to be surveyed determined, thus enabling an efficient program to be arranged and systematically executed.

Skilled and experienced men must be used for geological and other technical work involved in exploration. The interpretation of surface observations as a means of disclosing conditions underground is far from being an exact science, and requires long experience and mature judgment in addition to technical or theoretical knowledge. Such work must be directed by men who are qualified by both theoretical training and experience. Otherwise, real knowledge will end and heavy risk will begin much sooner than is necessary.

When detailed examination of a generally favorable area has disclosed a suitable structure in beds that might reasonably be expected to be oil bearing, and all the evidence which bears upon the soundness of such a conclusion has been competently reviewed and confirmed, there still remains another step for the reduction of risk before deciding to drill. This is to proceed with similar detailed studies of other highly favorable locations to permit a comparison of their relative probabilities of success. It is largely to allow such a final selection to be made that ample time is so important in the reduction of risk to capital investment. It seems unlikely that full-scale drilling tests will be carried on in more than one area at a time, at least early in the program or before an initial discovery has been made somewhere.

When the time comes to decide upon an actual drilling program, moreover, another question arises in connection with the main objectives of the program. This is whether, at that time, the controlling policy of the country is to continue with the drilling and other development work which follows the initial discovery of a new oil field, or to grant concessions at this time to private oil companies. The decision made in relation to one field need not necessarily apply to all other areas. There is no reason, that is, why a Government oil company could not undertake the development of one field and another field be developed by a private company under a concession.

If the decision in the case of a particular area is to have the national oil company exploit the field, the relative economy of "slim hole" and full-scale drilling must be examined as a means of reducing the capital risked in the test. ("Slim hole" drilling means putting down a small bore hole the full depth of the section to be tested. Ordinarily this can be done with much less cost than to drill a full-scale production well.) In the event that oil is discovered, the slim hole is useless for commercial production. If the test is dry, considerable loss may have been avoided; how much, will depend upon conditions in each case.

If, on the other hand, the main objective of the program, under conditions existing at the time, is to perform only sufficient work by the national oil company to realize the maximum benefits from a concession, the analysis must involve estimates of the relative costs, risks and returns at each progressive stage of the program.

A minimum return, without cost or risk, ordinarily results from non-competitive operation under a concession granted without knowledge by either party of geological conditions. This follows from the fact that all cost and the maximum risk is assumed by the concessionaire at the time the concession is signed. With moderate and progressively increasing costs, and practically no risk, the Government can conduct geological

exploration of a quality which will be accepted by prospective concessionaires, correspondingly reducing the risks to the concessionaire and increasing the royalty which can be expected from the concession. As the definite establishment of geological facts is continued, the cost of doing so mounts at an increasing rate, generally speaking, reaching the limiting case when full-scale test drilling is carried out in order to establish the extent and other characteristics of a proven oil field. From the Government's viewpoint this would represent "maximum cost, maximum risk and maximum returns", since it is not likely that a fully-proven field would be granted as a concession for less than the Government itself could realize by continuing to operate it. This high cost and high risk aspect puts it beyond the justifiable aspirations of any Government which does not have a very substantial revenue in excess of its ordinary needs. The private oil industry, on the other hand, has been evolved within a system which automatically provides, by a widely-distributed levy on all its consumers, a large capital fund expressly for the types of risk which inhere in maintaining the world supply of oil. Thus they are organically constituted to assume whatever risks they deem compatible with expected returns, or, conversely, to pay such royalties as correspond to the costs and risks undertaken.

To deal successfully with the practical economic problems which are involved in such analyses as have just been indicated requires, available to the Government, another type of skill and experience than is necessary for the conduct of technical exploration. Since problems in this general field already face Iran in connection with its existing concession, provision for such service is made in the organization recommended later.

It is not necessary at the present time to reach any definite conclusion as to how new oil discoveries should be made or developed, that is, whether by the national oil company or by private oil companies, national or foreign, or perhaps by some combination of these. It seems clear enough, in the circumstances, that the Government can very well employ the time, during which foreign participation is barred for political reasons, in attacking many of the basic oil problems which promise high returns at moderate cost and little or no risk. It appears futile, moreover, in the face of so many pressing needs in the country, to discuss details of possible future operations which are not urgent and for which in any case personnel and organization can be developed only slowly.

INITIAL OPERATIONAL PROGRAM

From our present point of view the most important things to be done are those which must be done first, or at least during the early stages of the program. It is these things for which preparations must be made in terms of policies, particular decisions, personnel, organization, advisory services, needed legislation, etc. Subsequent needs must be anticipated now chiefly to initiate courses of action which will require time to complete. An example is the selection of men for training in special fields which will become important at a later stage in the program; another example is the enactment of legislation which will be effective in preventing individuals from acquiring titles or other legal rights in prospective oil production areas with no other purpose than to make a private profit out of a public undertaking.

The operational program for the first year of the program will be quite simple to describe. Once it has been determined, the organization necessary to carry it out can

be defined. This will include the measures necessary to form the joint stock company which is called for in the Seven Year Plan law, and the special law which will be necessary to convey concessional rights to that company. Precisely how subsequent phases of the program will develop cannot be predicted. This will depend upon circumstances. If the organization is properly formed, however, and the personnel wisely selected and directed, future problems can be dealt with as they arise.

Mapping

This work is fundamental. All geological work is based upon reliable topographical maps for ground control. A scale of approximately 1/50,000 is desirable for general reconnaissance work. Such maps, although not always on this scale, will be needed for many other purposes in connection with Seven Year Plan work and their preparation will be very largely the responsibility of the General Engineering Department. It can be expected, however, that geological field work in some areas will proceed ahead of general topographical mapping, and competent topographers must therefore be included in the geological organization. Existing maps will, of course, be used wherever available. The topography and other details shown in many areas on existing maps, however, are not sufficiently accurate to be useful for geological work. In most cases they will serve for general location control, but the topography significant in geological work will have to be supplied as field work progresses. Such work should be co-ordinated with the requirements of the general topographic mapping program of the country in order to avoid unnecessary duplication of field work.

Photo-geology will expedite reconnaissance work vastly in difficult terrain. For this purpose aerial survey technique is not required, beyond identifiable photographs of suitable scale which can be tied into a ground control for location. No mosaic or aerial contouring is necessary. This part of the mapping program should also be co-ordinated with other Plan needs for aerial photography (such as for hydrographic, agricultural and forestry studies) and a unified plan arranged by the General Engineering Department, which will take into account the requirements of each such demand.

Geological Work

This will include the critical study of all available and relevant material, its summarization, classification and suitable arrangement in permanent central files for convenient reference. Field work will consist of field checks to confirm, correct or appraise the reliability of existing data, and systematic new work to supplement and extend that already available. To program this work will be the duty of the chief geologist. This program should be based primarily upon the priority of importance of various types of information. It should be arranged in such a way as to allow essential work to be done during favorable climatic conditions in the various areas without serious interruption. Appropriate periods must be allowed for field parties to work in the central office. The first stage of the field work will be aimed at the preparation of a geological map, area by area, for use in reconnaissance studies. This will include the preparation of cross sections and columns as directed by the chief geologist. At a later stage, detailed mapping of structures and other significant features will be required. A paleontologist will be required to divide his time between field parties and the paleontological laboratory. A central geological laboratory will be necessary. It will serve all the laboratory needs of all divisions. A geological mapping division will be required in the central office to serve all the mapping needs within the organization. Geophysical surveys are not

likely to be required during the first year of the program. In any case when such work becomes necessary it must be done by contract.

Drilling

The only operations of this character to be expected during the first year of the program are simple shallow bore holes for cores or structural determination to supplement surface indications, or cleaning out and logging existing holes which were drilled by others. Simple structural or core drilling can be done satisfactorily by local (Iranian) water well drilling contractors. Equipment for this purpose may have to be purchased by the Plan (or National Oil Company). Logging and cleaning out existing abandoned wells requires special technique and may require the services of foreign contractors, depending upon the character and extent of the work. Production drilling is hardly to be expected during the first year. In case it should be required it must be done by foreign contractors.

Sufficient drilling or work involving drilling practices is in view even during the first year to warrant having one experienced driller, preferably an American, in the organization. Even for the use of light drilling equipment an experienced man will be necessary for supervision and training employees. He will also supervise the purchase of necessary equipment and attend to technical details in connection with contract drilling. If an Iranian with suitable qualifications is available, consideration should be given to sending him to the United States (or elsewhere under American drillers) at an appropriate time, for intensive training in the operations which can be anticipated in Iran.

Oil Distribution and Utilization

Competent studies should be started at once to discover and direct improvements in the entire system of distributing, marketing, pricing, and utilization of oil products. This is a highly specialized field of work and can be successfully undertaken only by a man with the necessary training and experience. It seems apparent that a foreigner must be secured to direct such work initially and to train Iranians to continue and execute the program. Since it is futile to undertake so complex a problem without an expert to direct it, it is unnecessary to describe its detail here. Earlier discussion should be sufficient to demonstrate its high importance.

Appraisal of Broad Oil Industry Problems

In view of Iran's great dependence upon revenue from existing oil operations, the long history of disputes concerning this and other proposed concessions and finally the possibility of extensive future oil developments in the country, such an analysis as we have been making points strongly to the conclusion that the Government of Iran should have the full-time services of a highly qualified man to advise concerning all important aspects of this complex situation.

Iran's economic destiny at least for a long period ahead is closely tied to the oil developments in the country. The revenue and to some extent the many other benefits which result from this operation are, in turn, closely linked with world affairs over which neither the oil company nor the Government can exercise control. In such a situation it is futile, beyond a restricted range, for the Government to make demands or inflict penalties upon the company. Even within that range justifiable demands are

likely to be parried or opposed in the ordinary way of retaining all commercial advantages that are possible under legitimate practices. Within the bounds of legitimate practices on both sides, it is Iran's responsibility to look after the national interest in such a joint operation. The company's position is not one of unlimited trusteeship.

Many activities within the country, of immeasurably less importance, have entire departments established to administer their affairs. Surely here is one that warrants continuing attention of the highest competence.

The routine work of such an office should include the accumulation of data of many kinds which are necessary to understand or to anticipate significant changes in the world oil supply and demand. This information should include facts concerning the principal oil companies' resources, operation and markets. The office should draw upon all available sources of information which might be of value in guiding Iran's oil affairs. Its primary aim should be to protect and further Iran's own interests in national oil resources.

RECOMMENDED ORGANIZATION OF GOVERNMENT OIL AGENCIES

The Seven Year Plan stipulates that a Government-owned joint stock company shall be created for the purpose of exploring for, exploiting and marketing oil, all implicitly under the direction of the Plan Organization, since funds for the purpose are to be provided by it. This task must in our opinion be executed in several steps as summarized below.

First: A capable Iranian should be appointed at once as acting manager of the Petroleum Division (under the Plan director in charge of Technical Services). This manager would have the responsibility of guiding all oil affairs within the scope of the Plan until other agencies, old or new, have completely taken over the various functions assigned to them and the position of Manager of the Plan Petroleum Division becomes unnecessary.

Second: Chief among the agencies to assume particular oil functions will, of course, be the new Government-owned joint stock company. To form such a company, however, provide it with competent initial personnel, and watch various important aspects of its operations for assurance of compliance with Plan objectives and provisions, is itself no small task and will require continuing and in some cases expert business guidance. For this type of service we have recommended (in the section on organization) that a Department of Company and Business Service be created in the Plan Organization. It is to this Department that the petroleum manager would look for detailed direction in the formation of the new company, and to which the High Council of the Plan would look for continuing supervision of its activities as a commercial institution.

Third: As has already been intimated we recommend that a broadly-experienced and otherwise highly-qualified man be placed in the organization of the new oil company for the purpose of constantly studying and advising concerning industry and world market situations which might seriously affect Iran's interests. This expert would naturally have an important part, in the capacity of advisor, in all negotiations between the Government and actual or prospective concessionaires. We do not recommend, however, that responsibility for the administration of such concessions, if executed directly

between a private person or company and the Government, be transferred from the Ministry of Finance. It seems to us to be more appropriate that these affairs be dealt with directly by the responsible Ministry than to place them under the new oil company which will be more commercial than political in character and consequently only indirectly representative of the Government itself. This means that there will be two independent agencies charged with quite separate functions relating to oil development. The Department of Concessions, under the Ministry of Finance, will represent the Government in dealing with all concessions granted to non-government persons or companies, as in the past, except for the proposed availability of competent advisors. The new Government-owned oil company will conduct its own independent program under its own concession, including the functions described earlier in connection with marketing and general study of oil industry problems.

An added reason for not placing the function of concession administration under the new oil company, except in the case of its own or subsidiary operations, is that we can have no assurance of its permanence. At present it appears to fill an essential need in the program, but a change in high level policy concerning the granting of concessions to foreigners could extinguish this need.

Fourth: The proposed national oil company should be formed as a joint stock company under the Commercial Code of the country. We have prepared a draft of a charter complying with that code and making provisions for certain details of organization and procedure which we believe are advisable to assure effective accomplishment of this company's objectives. This draft appears as Appendix M-2 at the end of this section.

The administrative organization provided for by the proposed charter is briefly as follows:

The general direction of the company will be in the hands of a board of directors, elected by the Government through the Plan Organization, which is charged with the responsibility for this project. It will elect its own chairman.

It is recommended that the board of directors consist of seven members, of which three must be technically qualified and experienced in petroleum industry operations, and one qualified and experienced in company administration. These four should comprise the executive committee of the board. One of the three technically qualified directors should be appointed president of the company and act as the chief executive.

The remaining three (non-technical) directors should include the managing director of the Plan Organization. He should represent the Government as owner of the shares of the company; two directors at large (non-technical) should be selected on the basis of their sound judgment and public confidence in them.

The board as a whole should determine all general policies, operating programs and the company budget. The president should be charged to execute all projects within the program approved by the board. The board may, however, delegate certain of its powers to the executive committee with the stipulation that within the limitations of the authority thus delegated the president may act without further reference to the board.

The managing director of the Plan Organization should be responsible (to the Plan Organization) that the policies and general program of oil company operations conform to Plan objectives. Through his exercise of the Government's shareholder rights

he should control the election of all officers and directors of the company. He should have no executive functions within the company.

The administrative director should be in charge of financial, personnel and legal activities and all secretarial and miscellaneous services within the company.

One of the technically-qualified directors should be in charge of geological and other exploration activities and related services.

Another of the technically-qualified directors should be responsible for all activities aimed at improving oil distribution and marketing within the country.

The third of the technically-qualified directors should be charged with all activities relating to the production of oil by the company and the granting of subsidiary rights to private or joint (private and Government) Iranian companies formed for the purpose of producing, transporting or refining oil. He is charged also with maintaining wide and dependable knowledge of economic and commercial conditions and practices both within and outside the country which relate significantly to the national oil interests.

Fifth: A law should be enacted conveying concessional rights to the national oil company.

A draft of such a law which we believe would be appropriate forms Appendix M-3 at the end of this chapter.

Sixth: As soon as the adoption of a definite program makes it practicable, the three technically-qualified members proposed for the executive committee should be secured and placed in their permanent positions as the active directors of company operations. These men must be carefully selected and at least in the beginning must almost of necessity be foreigners, as it seems unlikely that Iranians with the necessary experience can be found.

BUDGET

The expenditures during the first year's operation of the proposed national oil company will depend largely upon the rate at which the organization can be assembled, having in mind that this type of work requires men of specialized qualifications. In any case the first work undertaken will necessarily be limited to preliminary investigations and surveys, both office and field, without involving any substantial expenditures for the more costly operations such as geophysical surveys or drilling. We estimate that the total expenditures for the first year (1328) will not exceed Rls. 12,000,000 plus approximately $250,000 which may be required for salaries and other costs of foreign experts, and for technical and mechanical equipment which must be purchased abroad.

The time required to complete the geological examination of the entire country, or of any area within it, depends almost entirely upon the size of the organization assigned to the task. The annual operating budget for this type of work, therefore, exclusive of drilling or other special projects, can be fixed at any reasonable figure and the amount of work done kept within that budget.

There is no basis upon which we can predict at this time how long it will be before extensive geophysical survey work should be started or when the first deep drilling will be required. It is not unlikely, however, that during the second year of geological field work, and perhaps even during the first year, light drilling equipment will be required

for structural investigations and for cleaning out and logging existing abandoned wells. If funds are available the necessary equipment should be purchased during the first year to have it in readiness when it is required.

In brief, once an adequate amount of money is provided for maintaining a minimum practicable organization, such as has been proposed here for the first year of operations, budgeting normal geological exploration is entirely a matter of urgency in terms of time. In the present case considerable flexibility can be assumed from that point of view.

At certain unpredictable stages of the work, however, very substantial expenditures may become necessary if advantage is to be taken of the information secured, and funds must be made available or progress stops. From the budgeting point of view this is extremely important and requires close coordination between the technical and financial aspects of management. For example, from the technical viewpoint a stage may be reached at which geophysical work is clearly indicated as the next step in exploration. Such work is expensive. Geophysical surveys, moreover, have no general commercial value, as surface geology may have, apart from oil. A geophysical survey is primarily for the purpose of fixing a location for a test well, if the indications are favorable. It should be regarded, therefore, as a step in preparation for drilling. Unless the company is prepared to drill, there is little point in conducting a geophysical survey, as any subsequent concessionaire is not likely to attach great value to such a survey, unconfirmed by drilling, unless it was supervised and interpreted by his own experts. Consequently under normal circumstances the decision to proceed with a geophysical survey should imply a readiness and an ability to undertake drilling if a structure is discovered. The consequent demands upon the budget may be heavy.

Below we give our recommended allocation of Plan funds for petroleum exploration and development:

	In Thousands of Rials		
	Domestic	Foreign Exchange	Total
1328—Second Half	12,000	8,125	20,125
1329	36,000	24,375	60,375
Remaining 5½ Years	350,000	325,000	675,000
Total	398,000	357,500	755,500

APPENDIX M-1

PETROLEUM LAW TENTATIVELY PROPOSED BY MINISTRY OF FINANCE—1327

ARTICLE 1: In order to explore for petroleum and to establish companies for the exploitation of the national petroleum resources; and in order to supervise the operations of companies holding oil concessions; and to centralize all government affairs concerning petroleum; an independent institution known as BUNGAH NAFT will be established under the jurisdiction of the Minister of Finance.

Note: The term *"petroleum"* refers to crude oil, asphalt, ozokerite, natural gas and any other mineral substances composed of hydrocarbons.

ARTICLE 2: Bungah Naft shall be administered by an Executive Board and a permanent council known as the Supreme Petroleum Council (hereinafter referred to as SPC).

The Executive Board shall consist of the Director General of Bungah Naft and his two assistants. The Director General shall be appointed by a Royal charter on the proposal of the Minister of Finance and the approval of the Council of Ministers. The two assistants will be appointed on the proposal of the Director General and the approval of the SPC. The period of tenure of office for the Director General and for the two assistants will be three years.

The SPC shall consist of the Director General and six other persons, three of whom shall be petroleum engineers and the remaining three experts, respectively, in finance, economics, and law.

The members of the SPC shall be appointed from among Persian nationals, on the proposal of the Minister of Finance and the approval of the Council of Ministers, for a period of three years.

The SPC shall be the highest authority in the Bungah Naft for making decisions, for planning operations, for executing the duties assigned to Bungah Naft and for consultation and taking action in all matters pertaining to petroleum. All decisions approved by a majority of the members of SPC shall be valid.

The SPC shall determine the powers of the Executive Board, the Director General, and the two assistants.

ARTICLE 3: The budget of the Bungah Naft shall be proposed by SPC and, after approval by the Minister of Finance, shall be incorporated as a whole in the general state budget each year.

Bungah Naft shall be administered on a commercial basis according to regulations approved by the Council of Ministers.

ARTICLE 4: Bungah Naft is charged to take steps to carry out the provisions of Note B of the law of 30 Mehr 1326 for the exploration of petroleum resources of Iranian territory outside the area of the AIOC concession. As soon as such exploration

produces successful results, Bungah Naft shall submit its proposals to the Government for exploitation of the oil-bearing area. To exploit the resources thus discovered the Government may either form state corporations or grant concessions to Iranian individuals or companies having suitable financial and technical qualifications, as provided under Article 6 hereof. The Government may also grant exploration-exploitation concessions to suitably qualified Iranian companies.

ARTICLE 5: The term *"Iranian company"* means a company which is registered in Iran, the shares of which bear the names of stockholders and of which shares at least 60 per cent are owned by Iranian citizens. Such shares shall be owned by the persons whose names appear on them and any private agreements regarding the transfer of such shares to other persons shall not be valid. The sale of 40 per cent of such shares to foreigners shall be subject to the approval of Bungah Naft, but in no circumstances may such shares be owned by a foreign government or by a foreign company a majority of whose shares is owned by foreign states.

ARTICLE 6: The conditions governing the granting of exploitation concessions to Iranian companies shall be the following:

A. The boundaries and the total area of the concession shall be proposed by Bungah Naft according to the geographical and geological conditions of the region, but in no case shall it include more than 1,000 square kilometres.

B. The period of an exploration-exploitation concession shall be 50 years.

C. The minimum land tax during the full period of the concession shall not be less than one gold Pahlevi, at the current market rate, per square kilometre per year.

D. The royalty shall be 16 per cent of the production or its equivalent in money at the market rate as determined by the Government.

E. At the end of the period of the concession, or upon its cancellation, all establishments connected with its exploitation shall become Government property, without charge.

Note: Should it be established that, because of foreign competition or because of world oil market conditions, Iranian exploitation companies cannot continue to operate with reasonable profit, the Government is authorized, upon the proposal of Bungah Naft, to return part of the royalty payable under this law in the form of a Government subsidy to those companies.

ARTICLE 7: Bungah Naft can grant non-exclusive permission for the construction of pipelines, refineries and distributing installations throughout Iran to such individuals and companies as have acquired exploitation or exploration-exploitation concessions according to this law, or to other Iranian companies having suitable financial and technical qualifications.

Note: Companies formed for the construction of pipelines or refineries or for the distribution of petroleum are obliged to make available a part of the capacity of their pipelines, refineries or marketing facilities for the transport, refining or distribution of petroleum belonging to the Government or to other exploitation companies, and in return receive a fair remuneration which shall be determined by the regulations pertaining to this law.

ARTICLE 8: The lands required by exploration exploitation, refining, transport or marketing companies, if barren and State owned, shall be given free of cost to such companies.

ARTICLE 9: The export of all petroleum products and of crude oil shall be free from customs and excise duties, and all imports which are necessary to the industrial operations of the petroleum companies shall also be free from customs and excise duties.

ARTICLE 10: The Government is charged to allot each year 10 per cent of the total foreign exchange acquired from AIOC, either as royalty or from the sale of exchange to AIOC, to meet the requirements of the Iranian oil companies. This foreign exchange will be placed at the disposal of Bungah Naft, which will distribute it among the companies according to their needs as recognized by Bungah Naft.

If the total amount of foreign exchange thus allotted in any one year is not used during that year, the balance remaining can be used in the following years.

Iranian oil companies may use part of the foreign exchange acquired through their exports for purchases of their necessary imports, and they may also pay profits due their foreign shareholders out of such foreign exchange.

ARTICLE 11: The Government is charged to establish Bungah Naft immediately upon the enactment of this law.

APPENDIX M-2

DRAFT OF PROPOSED STATUTES OF THE IRANIAN PETROLEUM COMPANY

CHAPTER 1

General

ARTICLE 1. The Iranian Petroleum Company is a joint stock company incorporated according to the Act of 26th Bahman 1327 (February, 1949) for the purposes of prospecting, exploiting, transporting, refining and marketing petroleum, its derivatives and its products in Iran and throughout the world.

ARTICLE 2. The head office of the company is in Tehran. The company may establish branches or agencies in Iran or abroad.

CHAPTER 2

Capital

ARTICLE 3. The initial capital of the company will be Rls. 100,000,000—divided in 100,000 shares of Rls. 1,000 each.

The Government shall own all shares and pay 34 per cent on each share in cash upon registration of the company and the remainder shall be paid up whenever required by the bond.

The shares of the company or the temporary certificates thereof shall not be transferable unless by means of a special Act of the Majless.

The Board of Directors is authorized to increase the capital of the company to Rls. 1,000,000,000—by issuing new shares or by increasing the value of each share from Rls. 1,000 to Rls. 10,000 as and when additional capital is required.

Every share is entitled to one vote.

CHAPTER 3

Organization

ARTICLE 4. The company shall have the following organs:

1. General Assembly of Shareholders
2. President of the Company
3. Board of Executives
4. Board of Directors
5. Auditors

CHAPTER 4

General Assembly of Shareholders

ARTICLE 5. The General Assembly may be of an ordinary or of an extraordinary nature.

The ordinary General Assembly will meet yearly at the head office at the invitation of the President. The date of such assembly will be fixed by the President but shall not be later than the 31st Shahrivar of each year.

An extraordinary General Assembly can be called at the suggestion of the President of the Company or whenever requested to do so by:

a. A group of shareholders holding jointly 20 per cent of the total shares of the company.

b. The Board of Auditors.

The agenda of all extraordinary general meetings shall be fixed by the authority calling for such meetings. Such meetings shall take place within one month of the date such request has been received by the President.

ARTICLE 6. The notice of the convention of an ordinary or extraordinary assembly shall be published in the Official Gazette at least ten days before the assembly is due to meet. The said notice shall indicate the place and the date (month, day, hour) of the convention of the assembly together with the agenda of the assembly. No questions can be discussed at a general assembly except those which have been clearly indicated in the agenda.

ARTICLE 7. The shares of the company owned by the Government shall be represented in all general assemblies by the Managing Director of the Seven Year Plan Organization for as long as it exists, and thereafter by such representation as may be designated by the Majless.

All Directors and Auditors shall be present at all general assemblies, without the right of voting.

ARTICLE 8. The Chairman of the Board of Directors or in his absence the eldest member of the Board of Directors shall open the general assembly and shall immediately afterward invite the shareholders to elect a Chairman and a Secretary from among those present.

ARTICLE 9. The duties of an Ordinary General Assembly are as follows:

1. Adoption of decisions concerning the annual report of the company and approval of the balance sheet and the profit and loss account after hearing the report of the Board of Auditors.
2. Adoption of decisions concerning the reserves.
3. Decisions in connection with any subject bearing on the company's operations which have been provided in the agenda or the assembly.
4. Election of the members of the Board of Directors.
5. Election of the Board of Auditors.

ARTICLE 10. The general meetings regardless of their nature, whether ordinary or extraordinary, shall have no power whatsoever to alter the provisions of these statutes for as long as the majority of the shares are owned by the Government, but can propose alterations for the approval of the Majless.

ARTICLE 11. All decisions of the General Assembly shall be passed by the majority vote of shareholders present, the quorum shall be fixed by the Commercial Law of 1314.

ARTICLE 12. The minutes of the General Assembly shall be entered in a special register to be signed by the Chairman and the Secretary of the Assembly and the Auditors. The above register shall be kept in a safe to be sealed by the Chairman and the Secretary of the Assembly and kept at the head office. Certified copies shall be established for the needs of the Board of Directors and Auditors.

CHAPTER 5

Board of Directors

ARTICLE 13. The Board of Directors shall consist of seven members, as follows:

1. Three ex-officio members namely:

   The Minister of Finance or his Deputy

   The Governor of the Bank Melli or his Deputy

   The Managing Director of the Seven Year Plan Organization or his Deputy.

2. Four members forming the Executive Committee, which shall be elected for a period of three years by the General Assembly of shareholders from among suitable and competent persons as described in Article (21).

ARTICLE 14. The Board of Directors shall elect a Chairman from among its members, who may be the President of the Company.

ARTICLE 15. The meetings of the Board of Directors shall be official if there are five persons present. Decisions shall be taken by majority vote of those present.

ARTICLE 16. The functions of the Board shall be as follows:

1. To approve the Company's program of works as proposed by the Executive Committee.
2. To fix the general line of the Company's general policy.
3. To approve the Company's general yearly budget and to grant special funds whenever required outside the budget.
4. To approve regulations concerning discharge and engagement of personnel; scale of salaries, wages and special allowances; purchases, sales, rents or leases; forms of contract for works to be carried out by contractors.
5. Form subsidiary companies and fix conditions under which shares of these subsidiary companies can be sold to the public. The purpose of such subsidiary companies may be to take over part of the activities of the Company.

6. To discuss and or to decide on any problems brought forward to the Board by the President.

ARTICLE 17. The Board shall meet regularly at least once every month or whenever required to do so by the President.

ARTICLE 18. The Board is authorized to obtain from the President any information it requires in order to fulfill its duties in a satisfactory way. The Board is also authorized to nominate consultants on any question brought up to the Board.

CHAPTER 6

Board of Executives

ARTICLE 19. Except in the cases stipulated in the statutes of the company as being the power of the General Assembly or the Board of Directors, the Executive Committee has full power to manage the affairs of the Company.

ARTICLE 20. All decisions of the Board of Executives will be taken by the President.

ARTICLE 21. The Executive Committee is composed of four eligible members of the Board of Directors, and shall have, respectively, the following qualifications and functions:

1. Administrative Director, qualified by training and previous experience to assume responsible direction of the financial and other administrative activities of the Company.
2. Technical Director, qualified by training and previous experience to assume responsible direction of geological and other exploration activities of the Company.
3. Technical Director, qualified by training and previous experience to assure responsible direction of petroleum product distribution, marketing and utilization.
4. Technical Director, qualified by training and previous experience to assume responsible direction of oil production and refining operations and to give expert advice concerning petroleum concessions and general oil industry conditions and practices which affect the national interests.

ARTICLE 22. The President of the Company is the head of the Executive Committee and is the supreme authority for the administration of the affairs of the Company in conformity with its statutes. He can delegate part or the whole of his authority to one or more members of the Executive Committee or to Department, Division or Branch Managers or to their authorized representatives.

He can engage or dismiss employees, appoint their duties, fix their salaries, and promote them, and in general administer the internal affairs of the Company in conformity with the regulations and the budget approved by the Board of Directors.

The President in person or through his attorney or attorneys will represent the company at the Tribunals. In general on all occasions the President is the representative of the Company.

ARTICLE 23. The President and the Members of the Executive Committee will be elected by the Board of Directors for a period of three years at the first meeting of the Board after its nomination.

ARTICLE 24. The President must keep the Board of Auditors informed of all decisions taken by the Board of Directors.

CHAPTER 7

Auditors

ARTICLE 25. Auditors shall be elected for one year at a General Assembly from among "comptables jures", "certified public accountants", "chartered accountants", or any other such persons or firms specially trained and qualified to perform such duties.

ARTICLE 26. The Auditors have no right to intervene directly in the affairs of the Company, but they can express their opinion by writing to the President or the Board of Directors.

ARTICLE 27. The Auditors have the following duties and rights:

1. Free access to all books and records and contracts and files.
2. Preparation of summary report to shareholders on the financial position of the Company.
3. Certification of financial statements of the company including a statement of assets and liabilities and profit and loss account.

CHAPTER 8

Balance Sheets and Division of Profits

ARTICLE 28. The Company's fiscal year commences on 1st Farvardin and ends on the last day of Esfand. The accounts of the Company are closed on the last day of Esfand and the balance sheets should be handed to auditors at least 40 days prior to the date of the General Assembly of Shareholders.

The approval of the balance sheet by the General Assembly is considered as final as regards the responsibility of the Board of Executives.

ARTICLE 29. The net profit of the Company shall consist of its income less its expenses and amounts to be written off.

The net profit in addition to the amount brought forward from the previous year and after deduction of taxes should be appropriated as follows:

1. Ten per cent of the net profit will be set aside as general reserve.
2. A part will be carried forward to the next year's account. The amount of this sum will be proposed by the Board and approved by the General Assembly.
3. The balance of the net profit will be distributed among the shareholders.

ARTICLE 30. The payment of dividend should be effected not later than 10 days from the date of approval of the balance sheet by the General Assembly.

CHAPTER 9

Various Regulations

ARTICLE 31. The members of the Board of Directors and the Board of Auditors, before assuming charge of their duties, should take oath at the General Assembly that they will not divulge any information concerning the Company's affairs which has been classified as confidential by the Board of Directors.

ARTICLE 32. Members of the Board of Directors and of the Board of Auditors cannot, during the term of their office and for two years following the end of their term of office, engage in any business or accept employment in any company or enterprise, whether private or otherwise, having activities or dealings with the exploration, exploitation, transportation, refining, marketing of petroleum and its derivatives.

ARTICLE 33. In any case concerning which the present statutes are silent the provisions of the Commercial Code shall be considered valid.

APPENDIX M-3

DRAFT OF PROPOSED LAW CONVEYING CONCESSIONAL RIGHTS TO THE IRANIAN PETROLEUM COMPANY

SINGLE ARTICLE: The Iranian Petroleum Company which is to be founded under the law of the Seven Year Plan shall have the exclusive right to explore for and exploit oil in all parts of Iran including such additional rights for oil exploitation and exploration as the Government of Iran may have or hereafter receive beyond its present territorial limits, except in those areas for which a concession has already been granted by the Majless.

NOTE 1: The Company shall have the privilege of importing freely and without payment of any charges (customs duties, road tax, rates, municipal taxes, etc.) anything that it may require for its operations. The Company is also exempt from the payment of any taxes or rates levied by the Government or municipalities or any charges which may augment the cost of the Company's products.

NOTE 2: Any lands, whether cultivated or waste, belonging to the Government and required by the Company for its operations shall be turned over to the Company free of charge.

Lands belonging to private individuals and required by the Company shall be acquired by mutual agreement. If no agreement as to compensation can be reached between the owner of the land and the Company within 30 days after written demand to the Court of First Instance, the case shall be referred to arbitration according to the Arbitration Law, the verdict of which shall be binding on both parties.

The Company's operations shall not be allowed, however, to suffer in case of no agreement and the Tribunals of First Instance are bound on the demand of the Company to bring the land under the Company's occupation pending the arbitration verdict.

In the evaluation of the land the value of oil contained therein shall not be taken in consideration.

NOTE 3: The Company has the privilege to establish all means of communication and transport and to extract any construction materials for its own requirements from any waste land. The exploitation of such construction material will be free of charge if taken out of the Government's estates and liable to the payment of royalty mentioned in the Mining Law of 17 Bahman 1319 if taken out of privately owned land.

EXHIBITS

EXHIBIT H-1

U. S. S. R.

U. S. S. R.

TURKEY

CASPIAN SEA

IRAQ

IRAN

AFGHANISTAN

PAKISTAN

SAUDI ARABIA

KUWAIT

PERSIAN GULF

GULF OF OMAN

OMAN

STRAIT OF HORMUZ

Pul-i-Dasht
Bahyasuar
Yengjeh
Shahpur
Ardebil
TABRIZ
Astara
Pahlevi
Badjgiran
Bujnurd
Ghuchan
Tabakan
Rezaiyeh
Maragheh
Mianeh
Fushen
RESHT
Bandar Shah
Gurgan
Miandoab
Mahabad
Khaneh
Zenjan
Chalus
Babul
Amul
Shahi
Shahrud
Sabzavar
MESHED
Kazvin
Yengikom
Takestan
Divan Darreh
Oljar
Karaj
TEHRAN
Firuzkuh
Samnan
Tayebat
Sanandaj
Rowan
HAMADAN
Saveh
Daryal-i-Namak
Qasr-i-Shirin
Harsin
KERMANSHAH
Qum
Araq
Kashan
Burujird
Ab-i-Kavir
Birjand
Ilam
Khorramabad
Azna
Dumbena
Naiin
ISFAHAN
Dizful
Yezd
Zabol
Abadeh
Ahwaz
Ram Hormoz
Rafsinjan
Kerman
Khorram-shahr
Behbahan
Abadan
Bandar Shahpur
Fehlian
Zahidan
SHIRAZ
Sirjan
Bandar Ganaveh
Mirjawa
Bushire
Firuzabad
Dowlat-abad
Asaluy
Bandar Abbas
Sampur
Lingh
Chahbahar
AT TAWAL

LEGEND

Road Projects with Numbers

Other Roads

KILOMETERS
0 50 100 150 200
SCALE

LOCATION OF ROAD PROJECTS

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

EXHIBIT H-2

U. S. S. R.

U. S. S. R.

TURKEY

CASPIAN SEA

Julfa

Shahpur

Ardebil

TABRIZ

Lake URMIA

Rezaiyeh

Maragheh

Mianeh

Pahlevi

RESHT

Ramsar

Farahabad

Babulsar

Chalus

Bandar Shah

Gurgan

Mahabad

Zenjan

Kazvin

Naushar

Babul

Shahi

Shahrud

Sabzavar

MESHED

Mehr-abad

TEHRAN

Semnan

Garmsar

HAMADAN

Ghum

Araq

Kashan

KERMANSHAH

Burujird

Khorramabad

Dasht-i-Kavir

Birjand

Naiin

ISFAHAN

Yezd

Dizful

IRAQ

AFGHANISTAN

I R A N

Ahwaz

Khorram-shahr

Abadan

Bandar Shahpur

Kerman

Zahidan

SHIRAZ

Sirjan

PAKISTAN

AT TAWAL

KUWAIT

Bushire

Dowlat-abad

PERSIAN GULF

Asalu

Bandar Abbass

Bampur

SAUDI ARABIA

Lingeh

Hormoz

Chisheh

STRAIT OF HORMUZ

Chahbahar

GULF OF OMAN

OMAN

LEGEND

- Present Railroads
- Extensions to be completed
- Construction deferred
- Seaports
- Airports

KILOMETERS
0 50 100 150 200
SCALE

LOCATION OF PRESENT RAILROAD WITH PROPOSED EXTENSIONS AND LOCATION OF SEAPORTS AND AIRPORTS

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR ROADS

In Thousands of Rials

Project Number	Roads	1328—Second Half	1329	Remaining 5½ Yrs.	Total
	Road building machines and tools	65,000	–	–	65,000
	Road maintenance machines				
1	Kermanshah—Tabriz				
	Kermanshah—Sanandaj	–	–	25,000	25,000
	Sanandaj—Miandoab	500	60,000	29,500	90,000
	Miandoab—Tabriz	–	–	26,000	26,000
2	Tehran—Ghum—Isfahan—Bushire				
	Tehran—Ghum				
	Ghum—Isfahan	400	54,600	–	55,000
	Isfahan—Shiraz	–	–	75,000	75,000
	Shiraz—Bushire	500	60,000	48,500	109,000
3	Takestan—Tabriz	400	50,000	40,600	91,000
4	Isfahan—Azna	–	–	36,600	36,600
5	Zenjan—Bijar—Divan Darreh				
	Zenjan—Bijar	–	–	52,000	52,000
	Bijar—Divan Darreh	–	–	20,000	20,000
6	Karaj—Chalus	200	–	30,000	30,200
7	Kazvin—Resht—Pahlevi				
	Kazvin—Kuhlin Pass	–	–	3,000	3,000
	Kuhlin Pass—Imamzadeh Hashem	–	–	30,800	30,800
	Imamzadeh Hashem—Resht	–	–	5,200	5,200
	Resht—Pahlevi	–	–	3,500	3,500
8	Khorram-abad—Harsin—Kermanshah	–	–	26,700	26,700
9	Trans—Northern Road				
	Tabakan—Meshed—Ghuchan	–	–	29,700	29,700
	Ghuchan—Bujnurd	–	–	28,000	28,000
	Bujnurd—Gombadabos—Gurgan	–	–	81,400	81,400
	Turkish Frontier—Maku—Khoy	–	–	14,000	14,000
10	Ghum—Bandar Abbass; Isfahan—Naiin				
	Ghum—Kashan	–	–	19,200	19,200
	Kashan—Naiin	–	–	49,200	49,200
	Naiin—Yezd—Kerman	–	–	55,500	55,500
	Rafsinjan—Bandar Abbass	–	–	98,600	98,600
	Isfahan—Naiin	–	–	31,800	31,800
11	Tehran—Firuzkuh—Shahi	–	–	35,700	35,700

Project Number	Roads	1328—Second Half	1329	Remaining 5½ Yrs.	Total
12	Tehran—Shahrud—Meshed				
	Tehran—Veramin	–	–	3,000	3,000
	Veramin—Garmsar	–	–	15,000	15,000
	Garmsar—Samnan	–	–	20,000	20,000
	Samnan—Shahrud—Miameh	–	–	48,000	48,000
	Miameh—Kahash	–	–	27,000	27,000
	Kahash—Meshed	–	–	67,000	67,000
13	Mohan—Ardebil—Gulan				
	Belyasuvar—Ardebil—Firuzabad	–	–	40,500	40,500
	Firuzabad—Heran	–	–	4,000	4,000
	Heran—Massule—Fumen	–	–	22,500	22,500
	Firuzabad—Mianeh	–	–	9,000	9,000
14	Meshed—Zahidan—Chahbahar				
	Junction Tehran Meshed Road—Zahidan	–	–	89,700	89,700
	Zahidan—Khash—Iranshahr—Chahbahar	–	–	191,300	191,300
15	Behbehan—Fehlian—Lahijan	–	–	52,500	52,500
16	South Coastal Road; Bushire—Bandar Abbass	–	–	92,400	92,400
17	Haraz River Road	–	–	164,000	164,000
18	Tehran—Saveh—Nubaran—Rovan				
	Tehran—Saveh	–	–	13,000	13,000
	Saveh—Rovan	–	–	34,000	34,000
19	Ghum—Arak—Burujird				
	Ghum—Arak	–	–	21,000	21,000
	Toreh—Burujird	–	–	13,500	13,500
20	Yangikom—Tabak—Miandoab				
	Yangikom—Tabak	–	–	22,500	22,500
	Tabak—Miandoab	–	–	19,500	19,500
21	Isfahan—Lurdajan—Ram Hormuz—Ahwaz	–	–	204,000	204,000
22	Kerman—Shiraz (via Rafsinjan)	–	–	60,000	60,000
	Total (excluding Machinery)	2,000	224,600	2,128,900	2,355,500
	Machinery	65,000	–	–	65,000
	Total	67,000	224,600	2,128,900	2,420,500

Exhibit H-4

TONNAGE OF CARGO HANDLED THROUGH THE PRINCIPAL SEAPORTS

Except Oil Ports of Anglo-Iranian Oil Company

Year		Persian Gulf Seaports							Caspian Seaports					Total
		Khorram-shahr	Bandar Shahpur	Bushire	Bandar Abbass	Lingeh	Chahbahar	Total	Pahlevi	Bandar Shah	Bandar Gaz	Naushahr	Total	
1314	Import	69,852	98,205	20,587	6,999	1,418	272	197,333	114,428	48,296	42,365	14,107	219,196	416,529
(1935)	Export	90,395	1,508	19,266	4,456	2,360	1,234	119,219	36,459	1,961	6,879	–	45,299	164,518
	Total	160,247	99,713	39,853	11,455	3,778	1,506	316,552	150,887	50,257	49,244	14,107	264,495	581,047
1319	Import	49,536	147,189	23,997	15,955	252	673	237,602	89,135	–	1,923	4,142	95,200	332,802
(1940)	Export	25,093	2,920	11,450	3,678	743	492	44,376	57,773	790	267	–	58,830	103,206
	Total	74,629	150,109	35,447	19,633	995	1,165	281,978	146,908	790	2,190	4,142	154,030	436,008
1324	Import	51,251	–	785	1,408	74	28	53,546	27,362	–	–	–	27,362	80,908
(1945)	Export	53,761	–	1,178	2,429	63	120	57,551	5,630	–	–	–	5,630	63,181
	Total	105,012	–	1,963	3,837	137	148	111,097	32,992	–	–	–	32,992	144,089
1326	Import	68,780	167,080	8,262	10,108	23	–	254,253	22,478	16,328	37	–	38,843	293,096
(1947)	Export	86,646	–	4,570	9,325	73	–	100,614	14,883	3,215	–	171	18,269	118,883
	Total	155,426	167,080	12,832	19,433	96	–	354,867	37,361	19,543	37	171	57,112	411,979
1327	Import	138,084	216,259	3,688	7,261	–	–	365,292	–	2,000	–	–	2,000	367,292
(1948)	Export	86,646	–	4,800	3,000	–	–	94,446	–	66	–	–	66	94,512
	Total	224,730	216,259	8,488	10,261	–	–	459,738	–	2,066	–	–	2,066	461,804
	Grand Total	720,044	633,161	98,583	64,619	5,006	2,819	1,524,232	368,148	72,656	51,471	18,420	510,695	2,034,927

Source: Statistique Annuelle du Commerce Extérieur de l'Iran
(except for year 1327 which has been estimated).

PRESENT ORGANIZATION AND ADMINISTRATION OF THE LARGER SEAPORTS IN IRAN (EXCLUDING OIL PORTS)

	Pahlevi	Naushahr	Bandar Shah	Khorram-shahr	Bandar Shahpur	Bushire	Lingeh	Bandar Abbass
Care of sea approaches, buoys, pilotage	General Ports Dept.	General Ports Dept.	General Ports Dept.	ISR (Ports) and Basra Port Directorate	ISR (Ports)	Iranian Navy		
Berthing of ships	General Ports Dept.	General Ports Dept.	ISR	Customs	ISR (Ports)			
Construction of harbor works	General Ports Dept.	General Ports Dept.	ISR	Customs	ISR (Ports)	Customs		
Construction of customs warehouses	Customs	Customs	Customs	Customs	Customs	Customs		Customs
Maintenance of harbor works	Ports Admin.	Ports Admin.	ISR	ISR (Ports) and Customs	ISR (Ports)	Customs		
Maintenance of port railroad system			ISR	ISR	ISR			
Ownership of land	Ports Admin.	Ports Admin.	ISR	ISR and Customs	ISR	Customs		
Ship discharge	Customs		ISR	Contractor	Contractor	Contractor		
Quay operations	Customs		ISR	Customs	Customs	Customs	Customs	Customs
Internal rail haulage			ISR	Customs and ISR	Customs and ISR			
Responsibility for cargo between ship and customs warehouses			ISR	None	Customs			
Delivery of cargo to rail			ISR	Customs and ISR	Customs and ISR			
Delivery of cargo to road	Customs		ISR	Customs	Customs	Customs	Customs	Customs

Exhibit H-6

ESTIMATED MAXIMUM TRAFFIC THROUGH THE PERSIAN GULF SEAPORTS DURING THE EXECUTION OF THE SEVEN YEAR PLAN

In Thousands of Metric Tons

	1328	1329	1330	1331	1332	1333	1334
IMPORTS							
Commercial cargo	200	200	250	300	300	300	300
Wheat (Government)	20	20	10	–	–	–	–
Sugar (Government)	100	100	75	75	75	75	75
Tea (Government)	10	10	10	10	10	10	10
Flour (Government)	–	–	–	–	–	–	–
Military supplies	60	–	–	–	–	–	–
Other Government cargo	20	20	20	20	20	20	20
Current construction							
Tehran water supply	10	20	20	15	–	–	–
Isfahan power	2	3	–	–	–	–	–
Shiraz water supply	2	2	–	–	–	–	–
Kuhrang tunnel	3	2	–	–	–	–	–
Subtotal	17	27	20	15	–	–	–
AIOC stores and equipment	100	100	100	100	100	100	100
Seven Year Plan equipment and supplies—							
Agriculture	10	30	70	100	100	100	100
Housing	10	10	10	10	10	10	10
Water supply	10	10	10	10	10	10	10
Communications	20	20	20	10	5	–	–
Power plants	2	4	8	10	10	5	5
Mining equipment	2	5	5	5	5	5	5
Industrial plants	5	10	10	10	10	10	10
Cement (in bags)	40	40	40	30	30	20	10
Railroad equipment	100	100	5	5	5	5	5
Roads	5	5	1	1	1	1	1
Airports	2	2	1	1	1	1	1
Seaports	1	1	1	–	–	–	–
Subtotal	207	237	181	192	187	167	157
Total Imports	734	714	666	712	692	672	662
EXPORTS							
Commercial (excluding red oxide and salt)	65	70	80	90	100	100	100
GRAND TOTAL	799	784	746	802	792	772	762

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR SEAPORTS

In Thousands of Rials

	1328—Second Half			1329			Remaining 5½ Years			Total		
	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total
Deferred maintenance	400	600	1,000	2,000	8,000	10,000	1,600	7,400	9,000	4,000	16,000	20,000
Training of Iranians	—	—	—	—	2,000	2,000	—	8,000	8,000	—	10,000	10,000
Port development												
Khorram-shahr	640	960	1,600	9,700	14,500	24,200	13,200	54,050	67,250	23,540	69,510	93,050
Bandar Shahpur	800	1,200	2,000	12,950	23,250	36,200	14,550	59,400	73,950	28,300	83,850	112,150
Bushire	800	1,200	2,000	3,000	20,000	23,000	26,750	74,550	101,300	30,550	95,750	126,300
Bandar Abbas	200	300	500	7,730	18,000	25,730	—	1,200	1,200	7,930	19,500	27,430
All ports (administrative)	1,000	—	1,000	600	400	1,000	1,800	1,200	3,000	3,400	1,600	5,000
Total	3,440	3,660	7,100	33,980	76,150	110,130	56,300	190,400	246,700	93,720	270,210	363,930
Study for future ports	—	—	—	—	—	—	200	300	500	200	300	500
Grand Total	3,840	4,260	8,100	35,980	86,150	122,130	58,100	206,100	264,200	97,920	296,510	394,430

Exhibit H-8

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR AIRPORTS

In Thousands of Rials

AIRPORTS	1328— 2ND HALF	1329	REMAINING 5½ YRS.	TOTAL
Tabriz	20,000	15,000	–	35,000
Mehr-abad (Tehran)	–	30,000	–	30,000
Shiraz	–	15,000	20,000	35,000
Meshed	–	–	35,000	35,000
Isfahan	–	–	40,000	40,000
Kermanshah	–	–	35,000	35,000
Resht	–	–	15,000	15,000
Babulsar	–	–	30,000	30,000
Ramsar	–	–	15,000	15,000
Zahidan	–	–	5,000	5,000
Ahwaz	–	–	10,000	10,000
Yezd	–	–	35,000	35,000
Bandar Abbass	–	–	15,000	15,000
Bushire	–	–	35,000	35,000
Gurgan	–	–	15,000	15,000
Pahlevi	–	–	15,000	15,000
Ghum	–	–	10,000	10,000
TOTAL	20,000	60,000	330,000	410,000

Exhibit H-9

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR TRANSPORTATION

In Thousands of Rials

		Railroads				
	Roads	Shahrud-Meshed	Mianeh-Tabriz	Seaports	Airports	Total
1328—Second half						
Domestic	2,000	30,000	30,000	3,840	20,000	85,840
Foreign exchange	65,000	–	–	4,260	–	69,260
Total	67,000	30,000	30,000	8,100	20,000	155,100
1329						
Domestic	224,600	70,000	25,000	35,980	60,000	415,580
Foreign exchange	–	–	–	86,150	–	86,150
Total	224,600	70,000	25,000	122,130	60,000	501,730
Remaining 5½ years						
Domestic	2,128,900	290,000	1,031,550	58,100	330,000	3,838,550
Foreign exchange	–	169,000	139,700	206,100	–	514,800
Total	2,128,900	459,000	1,171,250	264,200	330,000	4,353,350
Total						
Domestic	2,355,500	390,000	1,086,550	97,920	410,000	4,339,970
Foreign exchange	65,000	169,000	139,700	296,510	–	670,210
Total	2,420,500	559,000	1,226,250	394,430	410,000	5,010,180

EXHIBIT J-1

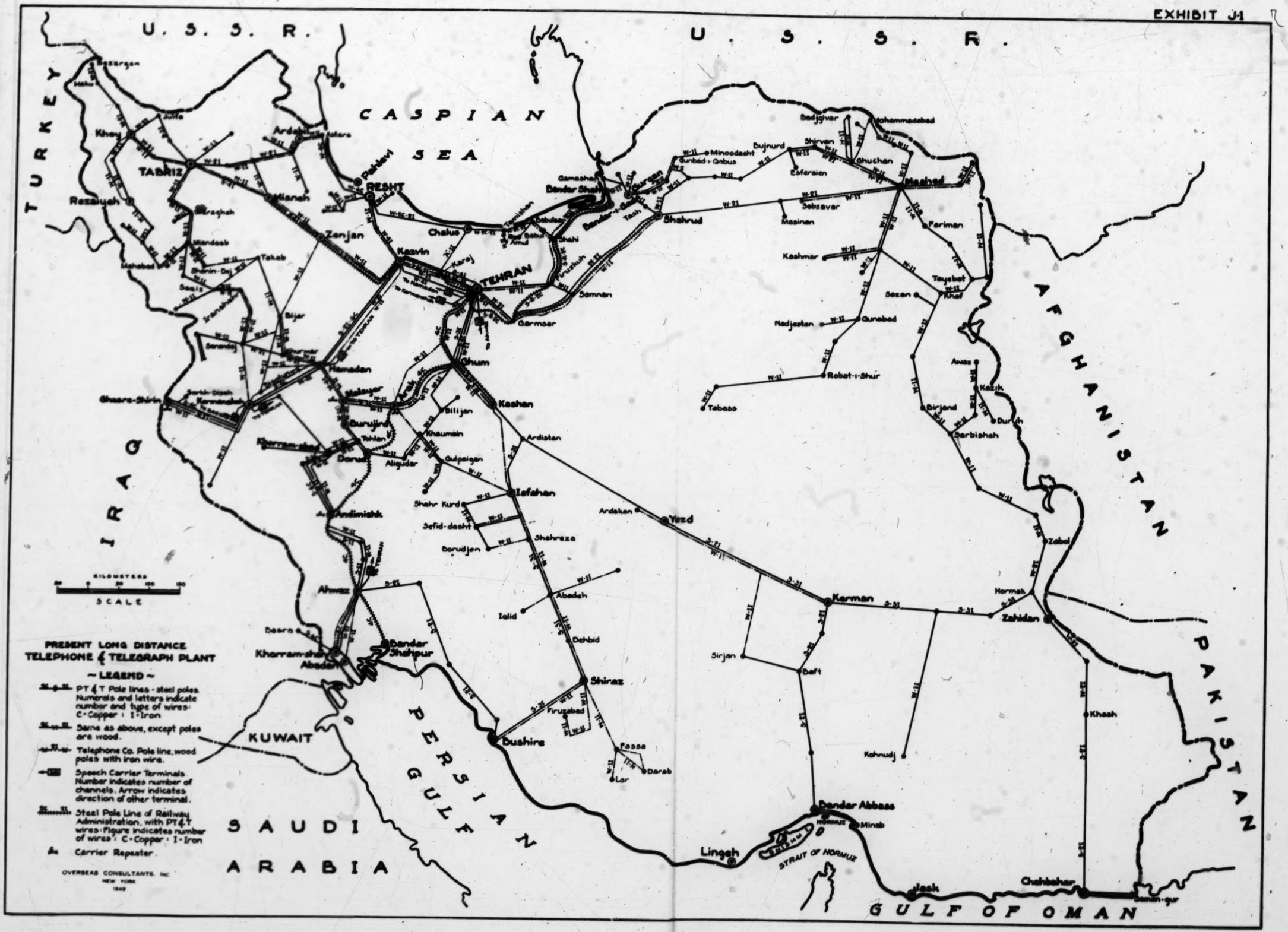
U. S. S. R.
U. S. S. R.
CASPIAN SEA
TURKEY
IRAQ
KUWAIT
SAUDI ARABIA
PERSIAN GULF
AFGHANISTAN
PAKISTAN
GULF OF OMAN
STRAIT OF HORMUZ
TABRIZ
RESHT
TEHRAN
Pahlevi
Bandar Shah
Gomishan
Gonbad-i-Qabus
Bujnurd
Minoodasht
Esfersien
Shirvan
Bodjgiver
Mohammadabad
Ghuchan
Meshed
Sebzavar
Shahrud
Masinan
Fariman
Kashmar
Tayebat
Khaf
Sazan
Nadjestan
Gunabad
Robat-i-Shur
Tabass
Anaz
Kazik
Birjand
Durukh
Gerbishah
Zabol
Hermak
Zahidan
Khash
Kahnudj
Sirjan
Baft
Kerman
Yezd
Ardakan
Shahreza
Abadeh
Dehbid
Shiraz
Firuzabad
Fassa
Darab
Lar
Lingeh
Bandar Abbass
Hormuz
Minab
Jask
Chahbahar
Iskenderun
Isfahan
Shahr Kurd
Sefid-dasht
Boroudjen
Ardistan
Kashan
Qum
Garmsar
Semnan
Damghan
Shahrud
Zanjan
Kazvin
Chalus
Ramsar
Sari
Amol
Babul
Shahi
Tonekabun
Rezaiyeh
Mianah
Miandoab
Takab
Mahabad
Bijar
Saqqez
Sanandaj
Kermanshah
Qasr-i-Shirin
Sarab-Dasht
Hamadan
Malayer
Arak
Burujird
Dilijan
Khaumain
Tehran
Qulpaigan
Aliqudar
Dezful
Andimishk
Ahwaz
Basra
Khorramshahr
Abadan
Bandar Shahpur
Bushire
Kuh-i-Taftan
Kuh-i-Hormuz
Kuh-i-Sabalan
Kuh-i-Shah
Kuh-i-Bazargan
Kuh-i-Mishu
Kuh-i-Sahand
Kuh-i-Kaf
Kuh-i-Dena
Kuh-i-Zard
Kuh-i-Kargan
Kuh-i-Kuh
Kuh-i-Jupar
Kuh-i-Hezar
Kuh-i-Bashakird
Kuh-i-Jebal-Barez
Kuh-i-Gugird
Kuh-i-Kalat
Kuh-i-Kuh-Sefid
Kuh-i-Kuh-Sefid
Kuh-i-Kuh-Sefid

EXHIBIT J-2

U. S. S. R.

U. S. S. R.

TURKEY

IRAQ

KUWAIT

SAUDI ARABIA

CASPIAN SEA

PERSIAN GULF

STRAIT OF HORMUZ

GULF OF OMAN

AFGHANISTAN

PAKISTAN

Bazargan

Maku

Khoy

Julfa

Ardabil

Astara

Rezaiyeh

TABRIZ

Mianeh

Pahlevi

RESHT

Present Steel Pole Line & 4 Copper & 1 Iron Wire

Present 1 Copper Wire & 1 Iron Wires of PTT Administration

Bandar Shah

Gurgan

Bujnurd

Ghuchan

Sabzevar

Nishabur

Meshed

Dorud

Chalus

Zanjan

Qazvin

TEHRAN

Damavand

Hamadan

Present System

Ghom

Kashan

Ghasre-Shirin

Kermanshah

Malayer

Arak

Burujird

Khorram-abad

Ardistan

Isfahan

Yazd

Andimishk

Ahwaz

Bandar Shahpur

Khorram-shahr

Shiraz

Kerman

Hormak

Zahidan

Baft

Bushire

Bandar-Abbas

Hormuz

Lingeh

Jask

Chahbahar

PROPOSED CONSTRUCTION PROGRAM - SEVEN YEAR PLAN
LONG DISTANCE TELEPHONE & TELEGRAPH PLANT & RADIO TELEPHONE & TELEGRAPH STATIONS

~ LEGEND ~

- Proposed steel pole line and copper wire.
- EC Indicates number of wires
- Present P.T. & T. pole line with proposed copper wire.
- Present Railways pole line with proposed copper wire.
- Proposed Railways pole line with proposed carrier terminal, figures indicate number of speech and telegraph channels and the arrow indicates the direction of transmission.
- Carrier Repeater.
- Card Circuit Repeater - Voice circuits.
- Radio Telephone & Telegraph transmitter - Figures indicate output power. Letter 'S' at end of arrow indicates 'Ship to Shore'.
- Long Distance Telephone & Telegraph Test Centers.

OVERSEAS CONSULTANTS Inc
NEW YORK
1949

KILOMETERS
0 50 100 150
SCALE

EXHIBIT J-3

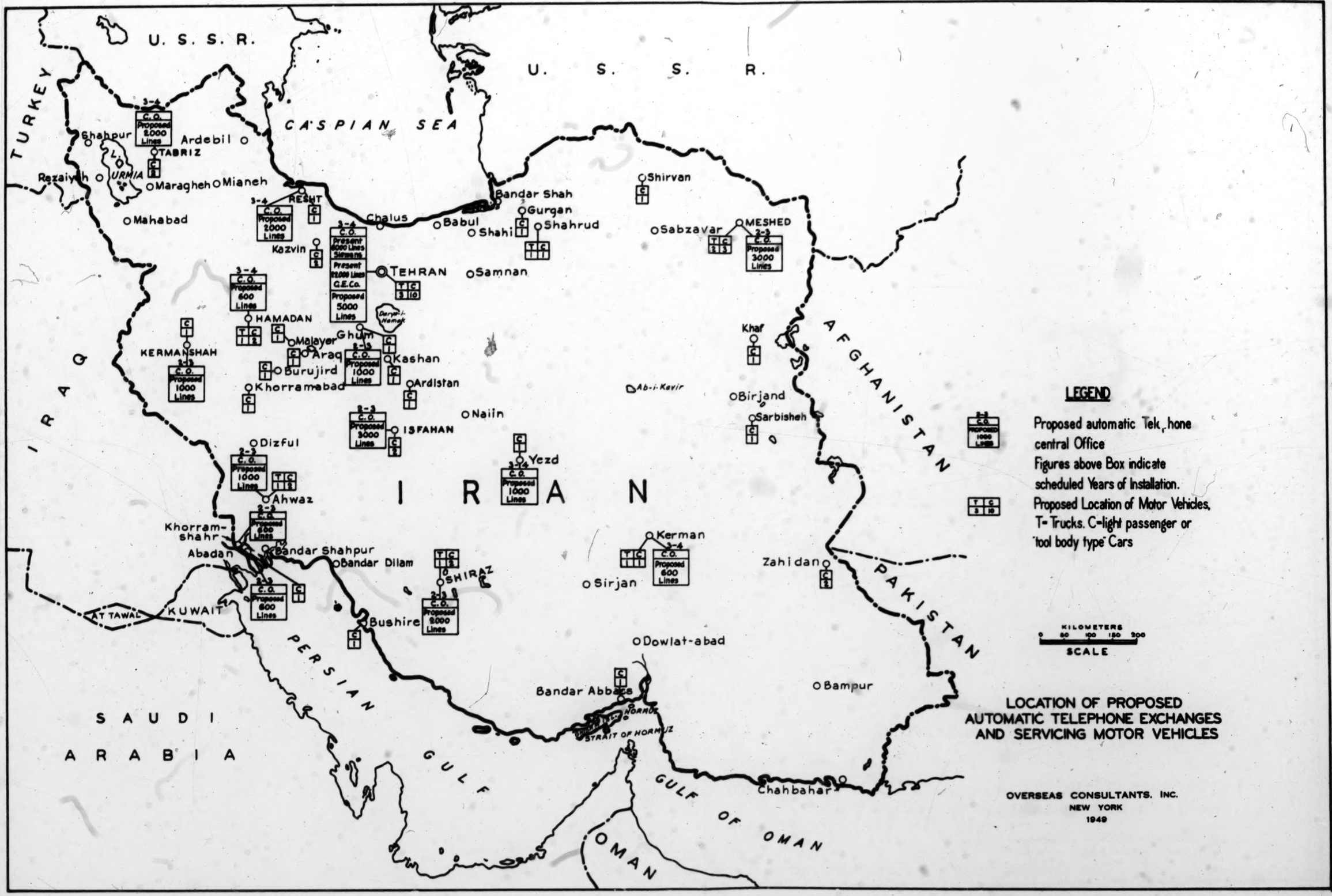
U. S. S. R.
U. S. S. R.
TURKEY
IRAQ
CASPIAN SEA
I R A N
AFGHANISTAN
PAKISTAN
SAUDI ARABIA
PERSIAN GULF
GULF OF OMAN
OMAN
KUWAIT
AT TAWAL
STRAIT OF HORMUZ
L. URMIA
Dasht-i-Kavir
Dasht-i-Namak
Shahpur
Ardebil
TABRIZ
Rezaiyeh
Maragheh
Mianeh
Mahabad
RESHT
Chalus
Babul
Shahi
Bandar Shah
Gurgan
Shahrud
Shirvan
Sabzavar
MESHED
Kazvin
TEHRAN
Samnan
HAMADAN
Malayer
Araq
Ghulm
Kashan
KERMANSHAH
Burujird
Khorramabad
Ardistan
Naiin
ISFAHAN
Yezd
Khaf
Birjand
Sarbisheh
Dizful
Ahwaz
Khorram-shahr
Abadan
Bandar Shahpur
Bandar Dilam
SHIRAZ
Kerman
Sirjan
Zahidan
Bushire
Dowlat-abad
Bandar Abbas
Bampur
Chahbahar
C.O. Proposed 2000 Lines
C.O. Present 4000 Lines Siemens Present 12000 Lines C.E.Co. Proposed 5000 Lines
C.O. Proposed 600 Lines
C.O. Proposed 1000 Lines
C.O. Proposed 3000 Lines
C.O. Proposed 9000 Lines
C.O. Proposed 6000 Lines
C.O. Proposed 8000 Lines
C.O. Proposed 1000 Lines
C.O. Proposed 3000 Lines
C.O. Proposed 600 Lines
C.O. Proposed 600 Lines
C.O. Proposed 1000 Lines
C.O. Proposed 1000 Lines
C.O. Proposed 3000 Lines
C.O. Proposed 1000 Lines
C.O. Proposed 600 Lines
C.O. Proposed 600 Lines
C.O. Proposed 9000 Lines
C.O. Proposed 1000 Lines
C.O. Proposed 3000 Lines
C.O. Proposed 1000 Lines
C.O. Proposed 600 Lines
C.O. Proposed 600 Lines
C.O. Proposed 3000 Lines
LEGEND
Proposed automatic Telephone central Office
Figures above Box indicate scheduled Years of Installation.
Proposed Location of Motor Vehicles, T= Trucks. C=light passenger or "tool body type" Cars
KILOMETERS
0 50 100 150 200
SCALE
LOCATION OF PROPOSED AUTOMATIC TELEPHONE EXCHANGES AND SERVICING MOTOR VEHICLES
OVERSEAS CONSULTANTS. INC.
NEW YORK
1949

EXHIBIT J-4

U. S. S. R.

U. S. S. R.

TURKEY

CASPIAN SEA

Shahpur

Ardebil

L. Urmia

TABRIZ

Rezaiyeh

Maragheh

Mianeh

RESHT

Bandar Shah

Mahabad

Chalús

Babul

Shahi

Gurgan

Shahrud

Sabzavar

MESHED

Kazvin

TEHRAN

Samnan

Sanandaj

HAMADAN

Ghum

Darvaje-Nemak

KERMANSHAH

Burujird

Araq

Kashan

IRAQ

Khorramabad

Ab-i-Kavir

Birjand

AFGHANISTAN

Naiin

ISFAHAN

Dizful

Yezd

Ahwaz

I R A N

Khorram-shahr

Abadan

Bandar Shahpur

Kerman

Zahidan

SHIRAZ

Sirjan

AT TAWAL

KUWAIT

Bushire

PAKISTAN

Dowlat-abad

PERSIAN GULF

Bandar Abbass

Bampur

SAUDI ARABIA

NORAK

STRAIT OF HORMUZ

GULF OF OMAN

Chahbahar

OMAN

LEGEND

- 20 Kw Short Wave
- 50 Kw Standard Band
- 1 Kw Standard Band
- 100 Watt Standard Band
- 7·5 Kw Short Wave (Existing)
- 2 Kw Standard Band

KILOMETERS
0 50 100 150 200
SCALE

LOCATION OF PROPOSED BROADCASTING STATIONS

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR COMMUNICATIONS

In Thousands of Rials

Project Number	Project Categories	1328—Second Half			1329			Remaining 5½ Years			Total		
		Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total
1–22	Wire Line and Carrier Plant	3,694	3,222	6,916	12,946	6,056	19,002	44,301	14,592	58,893	60,941	23,870	84,811
23	Automatic Exchange Plan	–	–	–	9	19,744	19,753	42,255	174,538	216,793	42,264	194,282	236,546
24	Branch and Subsidiary Long Distance Lines	–	–	–	1,000	–	1,000	18,750	–	18,750	19,750	–	19,750
25	Long Distance Line Test Equipment	–	–	–	–	250	250	–	3,414	3,414	–	3,664	3,664
26	Motor Vehicles	–	1,160	1,160	–	1,881	1,881	–	1,967	1,967	–	5,008	5,008
27	Construction Tools and Equipment	–	600	600	–	1,200	1,200	–	3,000	3,000	–	4,800	4,800
28	Operation and Maintenance Training Schools	2,000	–	2,000	2,000	–	2,000	10,000	–	10,000	14,000	–	14,000
29 & 36	Reconditioning Existing Radio Transmitters	151	97	248	–	–	–	–	–	–	151	97	248
30	International Radio Telephone Facilities	–	–	–	1,062	4,690	5,752	5,189	15,853	21,042	6,251	20,543	26,794
31	International Radio Telegraph — Receivers and Antennas	–	–	–	–	–	–	475	1,000	1,475	475	1,000	1,475
32 & 34	Domestic Radio Telephone and Telegraph	–	–	–	2,741	4,300	7,041	14,100	4,900	19,000	16,841	9,200	26,041
33	Marine Radio	–	–	–	–	–	–	25	600	625	25	600	625
35	New Telegraph Central Office, Tehran	–	–	–	7,000	675	7,675	13,000	2,675	15,675	20,000	3,350	23,350
37	High Power Short and Medium Wave Broadcast Transmitter	–	–	–	2,300	7,000	9,300	4,577	6,000	10,577	6,877	13,000	19,877
38	Regional and Local Broadcast Transmitters 1-Kilowatt	–	–	–	–	7,000	7,000	700	5,200	5,900	700	12,200	12,900
39	Local Broadcast Transmitters—Existing 100-Watt	–	–	–	–	–	–	2,870	1,630	4,500	2,870	1,630	4,500
40	New Broadcast Studio and Associated Equipment, Tehran	–	–	–	3,350	1,300	4,650	2,600	480	3,080	5,950	1,780	7,730
41	Boehme High Speed Transmitters and Receivers	–	–	–	200	800	1,000	–	–	–	200	800	1,000
42	Teleprinter Equipment and Accessories	–	–	–	–	–	–	–	6,800	6,800	–	6,800	6,800
43	Public Address Systems	–	–	–	–	–	–	1,000	3,250	4,250	1,000	3,250	4,250
44	School Laboratory and Library	–	–	–	1,000	810	1,810	5,000	–	5,000	6,000	810	6,810
	Total	5,845	5,079	10,924	33,608	55,706	89,314	164,842	245,899	410,741	204,295	306,684	510,979

Exhibit K-1

SUGGESTED RELOCATION OF NEW SPINDLES APPLIED FOR

		Number of Spindles				
			Presently Proposed		Recommended	
Ostan	City	Present installation	New Spindles	Total installation	Location of New Spindles	Total installation
1	Arak	–	10,000	10,000	20,000	20,000
	Kazvin	3,200	–	3,200	20,000	23,200
2	Babul	–	5,000	5,000	20,000	20,000
	Behshahr	32,400	–	32,400	–	32,400
	Ghum	6,668	11,060	17,728	16,060	22,728
	Kashan	6,760	56,480	63,240	56,480	63,240
	Samnan	9,480	5,000	14,480	10,000	19,480
	Shahi	26,000	–	26,000	–	26,000
	Tehran	6,242	167,240	173,482	52,400	58,642
	Veramin	–	20,000	20,000	–	–
3 & 4	Tabriz	8,080	10,700	18,780	30,750	38,830
5	Burujird	–	10,000	10,000	20,560	20,560
	Mehalat	–	5,560	5,560	–	–
	Kermanshah	–	–	–	20,000	20,000
6	Ahwaz	8,800	3,200	12,000	3,200	12,000
	Behbehan	–	–	–	15,000	15,000
7	Bushire	3,276	4,000	7,276	9,000	12,276
	Fassa	–	–	–	15,000	15,000
	Shiraz	11,376	39,000	50,376	39,000	50,376
8	Kirman	4,992	–	4,992	15,000	19,992
	Bandar Abbass	5,000	–	5,000	–	5,000
	Rafsinjan	–	5,000	5,000	–	–
	Zahidan	–	20,000	20,000	–	–
9	Meshed	10,210	–	10,210	9,790	20,000
10	Isfahan	40,902	39,080	79,982	39,080	79,982
	Shahreza	6,048	–	6,048	–	6,048
	Yezd	10,600	48,424	59,024	48,424	59,024
	Total	200,034	459,744	659,778	459,744	659,778

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR TEXTILES

In Thousands of Rials

	1328—Second Half			1329			Remaining 5½ Years			Total		
	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total
Cotton:												
Pool of Technicians	2,155	1,220	3,375	4,310	2,440	6,750	4,050	–	4,050	10,515	3,660	14,175
Engraving Plant	100	1,000	1,100	400	1,000	1,400	500	–	500	1,000	2,000	3,000
Rehabilitate Behshahr Mill	1,000	6,000	7,000	2,110	9,890	12,000	1,000	–	1,000	4,110	15,890	20,000
Rehabilitate Shahi Mill	1,000	4,000	5,000	2,100	9,900	12,000	1,000	–	1,000	4,100	13,900	18,000
30 Cotton Gins—Government Loan not over 50 per cent	–	–	–	–	–	–	5,000	10,000	15,000	5,000	10,000	15,000
Total	4,255	12,220	16,475	8,920	23,230	32,150	11,550	10,000	21,550	24,725	45,450	70,175
Silk:												
Continuous Egg Producing Station	200	100	300	400	200	600	200	–	200	800	300	1,100
Rehabilitate Chalus Silk Mill	600	1,500	2,100	1,200	2,600	3,800	600	–	600	2,400	4,100	6,500
Rehabilitate Chalus Power Plant	500	3,100	3,600	1,200	6,000	7,200	600	–	600	2,300	9,100	11,400
Total	1,300	4,700	6,000	2,800	8,800	11,600	1,400	–	1,400	5,500	13,500	19,000
Wool:												
Five wool mills—Government loan not over 50 per cent	–	–	–	5,000	15,000	20,000	20,000	60,000	80,000	25,000	75,000	100,000
Jute:												
Rehabilitate Shahi Mill	400	800	1,200	1,200	2,200	3,400	400	–	400	2,000	3,000	5,000
Total	5,955	17,720	23,675	17,920	49,230	67,150	33,350	70,000	103,350	57,225	136,950	194,175

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR CEMENT, CONSTRUCTION MATERIALS, ARMY MUNITIONS, SUGAR AND DRIED FRUIT PACKING PLANTS

In Thousands of Rials

	1328—Second Half			1329			Remaining 5½ Years			Total		
	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total
Cement:												
Rehabilitation of Tehran plant	10,000	17,500	27,500	7,500	–	7,500	–	–	–	17,500	17,500	35,000
2 - 200 ton plants*	10,000	25,000	35,000	20,000	75,000	95,000	20,000	10,000	30,000	50,000	110,000	160,000
3 - 200 ton plants*	–	–	–	–	–	–	75,000	165,000	240,000	75,000	165,000	240,000
Total Cement	20,000	42,500	62,500	27,500	75,000	102,500	95,000	175,000	270,000	142,500	292,500	435,000
Other Construction Materials:												
Mechanization of Tehran brick plant	1,300	3,000	4,300	1,300	900	2,200	–	–	–	2,600	3,900	6,500
60 ton gypsum plant*	250	2,000	2,250	900	1,500	2,400	350	–	350	1,500	3,500	5,000
125 ton hydrated lime plant*	–	–	–	500	5,000	5,500	3,000	4,000	7,000	3,500	9,000	12,500
Foreign technicians	100	210	310	200	380	580	100	210	310	400	800	1,200
Total Other Construction Materials	1,650	5,210	6,860	2,900	7,780	10,680	3,450	4,210	7,660	8,000	17,200	25,200
Army Munitions	15,000	650	15,650	7,000	10,000	17,000	20,000	28,350	48,350	42,000	39,000	81,000
Sugar:												
Rezaiyeh and Turbat-i-Haidari plants	100,000	113,000	213,000	113,000	–	113,000	–	–	–	213,000	113,000	326,000
Veramin refinery	1,000	15,000	16,000	4,000	15,000	19,000	–	–	–	5,000	30,000	35,000
Marv-dasht expansion	–	–	–	–	–	–	9,000	21,000	30,000	9,000	21,000	30,000
Ahwaz refinery	–	–	–	–	–	–	88,000	79,000	167,000	88,000	79,000	167,000
3 raw sugar mills in Ahwaz area	–	–	–	–	–	–	210,000	114,000	324,000	210,000	114,000	324,000
Total Sugar	101,000	128,000	229,000	117,000	15,000	132,000	307,000	214,000	521,000	525,000	357,000	882,000
Dried Fruit Packing:												
2 - 6000 ton plants	1,200	1,200	2,400	600	600	1,200	–	–	–	1,800	1,800	3,600
3 - 2500 ton plants	–	–	–	–	–	–	1,200	1,200	2,400	1,200	1,200	2,400
Total Dried Fruit Packing	1,200	1,200	2,400	600	600	1,200	1,200	1,200	2,400	3,000	3,000	6,000

* Government participation assumed 50 per cent.

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR CHEMICAL INDUSTRIES

In Thousands of Rials

	1328—Second Half			1329			Remaining 5½ Years			Total		
	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total
Sulphuric acid plant rehabilitation	438	812	1,250	–	–	–	–	–	–	438	812	1,250
Nitric acid plant expansion	1,175	325	1,500	–	–	–	–	–	–	1,175	325	1,500
Fertilizer—studies and new plant	100	–	100	200	–	200	69,800	130,000	199,800	70,100	130,000	200,100
Soap production—Tehran plant	2,750	3,250	6,000	1,375	14,625	16,000	–	–	–	4,125	17,875	22,000
Insecticides—studies	600	–	600	–	–	–	–	–	–	600	–	600
Soda ash—study and new process	500	–	500	3,050	3,250	6,300	–	–	–	3,550	3,250	6,800
Caustic soda—new electrolytic plant	–	–	–	2,312	5,688	8,000	1,500	3,250	4,750	3,812	8,938	12,750
Miscellaneous projects	–	–	–	1,750	3,250	5,000	–	–	–	1,750	3,250	5,000
Total Chemical Industries	5,563	4,387	9,950	8,687	26,813	35,500	71,300	133,250	204,550	85,550	164,450	250,000

Exhibit K-5

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR MINING

In Thousands of Rials

	1328—Second Half			1329			Remaining 5½ Years			Total		
	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total
Coal Mines:												
Shemshak	3,448	3,861	7,309	4,367	3,310	7,677	2,270	980	3,250	10,085	8,151	18,236
Zirab and Dililum	3,607	3,184	6,791	5,886	2,920	8,806	644	980	1,624	10,137	7,084	17,221
Golanderud	1,686	2,360	4,046	617	195	812	2,373	634	3,007	4,676	3,189	7,865
Garjareh and Elika	4,010	2,149	6,159	1,915	2,861	4,776	4,043	816	4,859	9,968	5,826	15,794
Abr Extension	708	493	1,201	1,081	415	1,496	–	–	–	1,789	908	2,697
Chashmeh-Gol	377	208	585	162	–	162	–	–	–	539	208	747
Kerman	4,777	2,502	7,279	3,462	1,218	4,680	2,276	488	2,764	10,515	4,208	14,723
Central Coal Testing Laboratory	40	160	200	–	–	–	–	–	–	40	160	200
Exploration	1,000	–	1,000	1,000	–	1,000	1,250	–	1,250	3,250	–	3,250
Total	19,653	14,917	34,570	18,490	10,919	29,409	12,856	3,898	16,754	50,999	29,734	80,733
Copper Mines:												
Damanghal (Abbas-abad)	102	1,383	1,485	3,389	3,412	6,801	–	–	–	3,491	4,795	8,286
Maden Buzorg	65	–	65	–	–	–	–	–	–	65	–	65
Talmessie (Anarak)	98	390	488	–	–	–	–	–	–	98	390	488
Bagherogh	162	–	162	–	–	–	–	–	–	162	–	162
Meskani	162	–	162	29	279	308	2,600	3,900	6,500	2,791	4,179	6,970
Bayaheh-bagh (Zenjan)	740	396	1,136	–	–	–	2,600	3,900	6,500	3,340	4,296	7,636
Examination and Exploration	–	–	–	568	568	1,136	–	–	–	568	568	1,136
Total	1,329	2,169	3,498	3,986	4,259	8,245	5,200	7,800	13,000	10,515	14,228	24,743
Lead Mines	324	1,300	1,624	–	–	–	–	–	–	324	1,300	1,624
Chromium Mine Minab District	32	–	32	–	–	–	–	–	–	32	–	32
Iron Mines	5,845	8,379	14,224	3,633	9,659	13,292	177	702	879	9,655	18,740	28,395
Red Oxide of Iron Mine—Hormuz	553	910	1,463	1,050	1,950	3,000	3,045	5,655	8,700	4,648	8,515	13,163
Salt Mine—Chishm	664	440	1,104	4,500	7,500	12,000	6,225	11,025	17,250	11,389	18,965	30,354
Sulphur Mine—Dejesian	71	286	357	52	208	260	–	–	–	123	494	617
Fire Clay Mine	32	–	32	–	–	–	–	–	–	32	–	32
Foreign Personnel	485	1,523	2,008	923	2,184	3,107	1,560	3,997	5,557	2,968	7,704	10,672
Exploration for New Mineral Deposits	568	81	649	1,203	747	1,950	3,739	2,361	6,100	5,510	3,189	8,699
Total Mining	29,556	30,005	59,561	33,837	37,426	71,263	32,802	35,438	68,240	96,195	102,869	199,064

MINING
RECOMMENDED WORK AND EQUIPMENT AND ESTIMATED COST

In Thousands of Rials

	1328—Second Half	1329	Remaining 5½ Years	Total
Coal Mines				
Shemshak:				
12,000 meters diamond drilling	910	1,820	–	2,730
5,000 meters of underground development	1,950	2,930	–	4,880
1 – Road grader	455	–	–	455
1 – Rotary snow plow	650	–	–	650
3 – Ten ton tractors with 15 self-dump trailers	1,460	–	–	1,460
1 – 300 cubic foot portable compressor	–	487	–	487
Hand mining tools	162	–	–	162
10,000 meters of track	813	2,440	1,625	4,878
12–¾ cubic meter side dump cars	585	–	–	585
Installation of aerial tram from Zirab	–	–	1,625	1,625
Sluices for coal washing	162	–	–	162
Geological survey	162	–	–	162
Total	7,309	7,677	3,250	18,236
Zirab and Dililum:				
12,000 meters of diamond drilling	910	1,820	–	2,730
7,000 meters of underground development	2,275	4,550	–	6,825
1 – 300 cubic foot portable compressor, drills, sharpener, and other accessories	650	–	–	650
Hand mining tools	162	–	–	162
Portable saw mill	780	–	–	780
10,000 meters of track	812	2,436	1,624	4,872
15—1 cubic meter side dump cars	878	–	–	878
Sluices for coal washing	162	–	–	162
Topographical survey	162	–	–	162
Total	6,791	8,806	1,624	17,221
Golanderud:				
3,000 meters of underground development	487	487	1,951	2,925
1—300 cubic foot portable compressor	487	–	–	487
4—Fans and engines, ventilating pipe, and 100 electric miners' lamps	975	–	–	975
3,000 meters of track	244	325	1,056	1,625
8—¾ cubic meter side dump cars	390	–	–	390
Hand mining tools	97	–	–	97
Portable saw mill	878	–	–	878
Sluices and screens for washing and sizing coal	488	–	–	488
Total	4,046	812	3,007	7,865

Recommended Work and Equipment	In Thousands of Rials: 1328—Second Half	1329	Remaining 5½ Years	Total
Coal Mines (Cont'd.)				
Garjareh and Elika:				
3,000 meters of underground development	487	487	1,951	2,925
3,000 meters of diamond drilling	228	228	227	683
Compressor now enroute	97	–	–	97
3,000 meters of track	244	325	1,056	1,625
8—¾ cubic meter side dump cars	390	–	–	390
Hand mining tools	162	–	–	162
Sluices for coal washing	488	–	–	488
2—Units of by-product coke oven	–	2,438	–	2,438
Rotary snow plow	650	–	–	650
1—Road grader	488	–	–	488
Strengthening and widening bridge and annual maintenance	2,438	325	1,625	4,388
3—Ten ton tractors with 15 twenty ton self dump trailers	487	973	–	1,460
Total	6,159	4,776	4,859	15,794
Abr Extension:				
2,000 meters of diamond drilling	227	227	–	454
1,500 meters of underground development	488	977	–	1,465
12—¾ cubic meter side dump cars	292	292	–	584
Hand mining tools	97	–	–	97
Road construction	97	–	–	97
Total	1,201	1,496	–	2,697
Chashmeh-Gol:				
1,000 meters of diamond drilling	260	–	–	260
500 meters of underground development	325	162	–	487
Total	585	162	–	747
Kerman:				
Geological and topographical surveys	162	–	–	162
5,000 meters of diamond drilling	227	910	–	1,137
5,000 meters of underground development	1,625	1,950	1,300	4,875
1,000 meters of shafts and winzes including two small hoists	130	520	650	1,300
5,000 meters of track	813	813	814	2,440
12—¾ cubic meter side dump cars	585	–	–	585
Portable compressor and pick steel	487	–	–	487
Sluices for coal washing	–	487	–	487
Buildings	3,250	–	–	3,250
Total	7,279	4,680	2,764	14,723

Recommended Work and Equipment	In Thousands of Rials: 1328—Second Half	1329	Remaining 5½ Years	Total
Coal Mines (Cont'd.)				
Central Coal Testing Laboratory:				
Total	200	–	–	200
Exploration for New Coal Deposits at:				
(1) Cheshtagh-Gurgan				
(2) Lar and Demavand				
(3) Azarbaijan				
Total	1,000	1,000	1,250	3,250
Copper Mines				
Damaghal (Abbas-abad):				
1,000 meters of diamond drilling	88	204	–	292
100 meters of underground development	–	97	–	97
1 – 300 cubic foot portable compressor	325	–	–	325
Tests and pilot plant to determine metallurgical treatment	975	–	–	975
Repair of flotation plant	–	1,625	–	1,625
Repair of leaching plant	–	1,625	–	1,625
Repair of fine crushing plant	–	3,250	–	3,250
Hand mining tools	97	–	–	97
Total	1,485	6,801	–	8,286
Maden Buzorg:				
Cost to salvage blast furnace and supplies and remove to Abbas-abad	65	–	–	65
Total	65	–	–	65
Talmessie (Anarak):				
1 – 300 cubic foot portable compressor and detachable bit and steel	488	–	–	488
Total	488	–	–	488
Bagherogh:				
Cost of salvage	162	–	–	162
Total	162	–	–	162
Meskani:				
500 meters of diamond drilling	–	146	–	146
Installing hoist from Bagherogh	162	–	–	162
Test on ore concentration	–	162	–	162
Concentrating plant, size to be determined by results of development	–	–	6,500	6,500
Total	162	308	6,500	6,970

Recommended Work and Equipment	In Thousands of Rials 1328—Second Half	1329	Remaining 5½ Years	Total
Copper Mines (Cont'd.)				
Bayaheh-Bagh (Zenjan):				
1,000 meters of diamond drilling	292	–	–	292
Repair of buildings and roads	650	–	–	650
Sample of ore (about 5 tons) shipped for test	32	–	–	32
Test on ore concentration	162	–	–	162
Concentrating plant, size to be determined by results of development	–	–	6,500	6,500
Total	1,136	–	6,500	7,636
Examination and Exploration:				
Kara-Dagh (Azarbaijan)	–	812	–	812
Senjedeh district	–	162	–	162
Bahrasman district	–	162	–	162
Total	–	1,136	–	1,136
Lead Mines				
1,000 meters of diamond drilling at each of the following privately-owned mines:				
Chah Kabuzeh (Anarak)	292	–	–	292
Makhlak (Anarak)	292	–	–	292
Resht	260	–	–	260
Damghan	260	–	–	260
Yezd	260	–	–	260
Afshar (Azarbaijan)	260	–	–	260
Total	1,624	–	–	1,624
Chromium Mine				
Minab district examination	32	–	–	32
Total	32	–	–	32

Recommended Work and Equipment	In Thousands of Rials: 1328—Second Half	1329	Remaining 5½ Years	Total
Iron Mines				
5,000 meters of diamond drilling	292	292	879	1,463
20,000 meters of track	9,870	–	–	9,870
3—25 ton Diesel locomotives and 21 cars	–	9,750	–	9,750
1 Caterpillar bulldozer, 2 slushers, road construction, and loading bins	3,250	3,250	–	6,500
Tests on coal and iron ore and layout of blast furnace plant and pipe foundry	812	–	–	812
Total	14,224	13,292	879	28,395
Red Oxide of Iron Mine				
Hormuz:				
5,000 meters of diamond drilling	1,138	–	–	1,138
Re-laying of track	325	–	–	325
Bulldozer and carryall	–	500	1,450	1,950
1—Sea-going tug	–	900	2,350	3,250
4 lighters with clam shell buckets equipment	–	1,600	4,900	6,500
Total	1,463	3,000	8,700	13,163
Salt Mine				
Ghishm:				
Surveying, sampling and drilling	1,104	–	–	1,104
Jetty, loading bins, and facilities	–	9,500	10,000	19,500
4 lighters with clam shell buckets equipment	–	1,600	4,900	6,500
1—Sea-going tug	–	900	2,350	3,250
Total	1,104	12,000	17,250	30,354
Sulphur Mine				
Delesian:				
1,000 meters of diamond drilling	260	–	–	260
Hand mining tools	97	–	–	97
Mine hoist	–	260	–	260
Total	357	260	–	617
Fire Clay Mine				
Development work by pits to determine extent and quality of deposit	32	–	–	32
Total	32	–	–	32

Recommended Work and Equipment	In Thousands of Rials: 1328—Second Half	1329	Remaining 5½ Years	Total
Foreign Personnel				
1—Mining engineer	325	650	2,275	3,250
2—Mine foremen	273	546	818	1,637
2—Timber shift bosses	195	390	585	1,170
2—Mine shift bosses	195	390	585	1,170
2—Diamond drill foremen	234	468	233	935
2—Master mechanics	234	468	703	1,405
1—Mine accountant	162	163	–	325
Travelling expenses from U. S. A.	390	32	358	780
Total	2,008	3,107	5,557	10,672
Program for Exploration for New Mineral Deposits				
Prospecting—cost of 50 sets of mineral specimens, supervisory staff, and preliminary examination	325	650	1,790	2,765
Geophysical surveys	–	650	1,630	2,280
Geological surveys	162	325	1,790	2,277
Research group to study old documents and records related to ancient mining and metal working activities	162	325	890	1,377
Total	649	1,950	6,100	8,699
Blast Furnace and Pipe Foundry				
Examination by foreign specialists	800	–	–	800
1—150-ton blast furnace and beehive coke oven	–	21,000	76,500	97,500
Pipe foundry	–	7,000	25,500	32,500
Total	800	28,000	102,000	130,800

RECOMMENDED ALLOCATION OF PLAN

In Thousands

	1328—Second Half			
	Domestic	Foreign Exchange	Total	Domestic
Textiles	5,955	17,720	23,675	17,920
Cement	20,000	42,500	62,500	27,500
Construction Materials	1,650	5,210	6,860	2,900
Army Munitions	15,000	650	15,650	7,000
Sugar	101,000	128,000	229,000	117,000
Dried Fruit Packing	1,200	1,200	2,400	600
Chemical Industries	5,563	4,387	9,950	8,687
Mining	29,556	30,005	59,561	33,837
Iron and Steel	80	720	800	5,000
Total	180,004	230,392	410,396	220,444

UNDS FOR INDUSTRY AND MINING

of Rials

1329		Remaining 5½ Years			Total		
Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total
49,230	67,150	33,350	70,000	103,350	57,225	136,950	194,175
75,000	102,500	95,000	175,000	270,000	142,500	292,500	435,000
7,780	10,680	3,450	4,210	7,660	8,000	17,200	25,200
10,000	17,000	20,000	28,350	48,350	42,000	39,000	81,000
15,000	132,000	307,000	214,000	521,000	525,000	357,000	882,000
600	1,200	1,200	1,200	2,400	3,000	3,000	6,000
26,813	35,500	71,300	133,250	204,550	85,550	164,450	250,000
37,426	71,263	32,802	35,438	68,240	96,195	102,869	199,064
23,000	28,000	34,000	68,000	102,000	39,080	91,720	130,800
244,849	465,293	598,102	729,448	1,327,550	998,550	1,204,689	2,203,239

ELECTRIC POWER REQU

OSTAN

CITY		RESHT	
Population Estimate for 1327		140,000	
YEAR		1332	1335
Population Estimate		147,000	154,000
GENERAL DISTRIBUTION LOADS			
Residential, commercial and municipal sales	kwh	5,140,000	9,240,000
Kwh per capita		35	60
Small industrial sales	kwh	1,700,000	3,080,000
TOTAL SALES	kwh	6,840,000	12,320,000
Kwh per capita		47	80
Distribution losses—percent		23	23
Plant output	kwh	8,410,000	15,150,000
Annual loan factor—percent		32	36
Peak load		3,000	4,810
Watts per capita		20	31
LARGE INDUSTRIAL NEEDS			
Present industrial needs	kw	800	800
Added industrial to year:		800	–
Added industrial to year:		–	1,800
TOTAL PEAK LOADS		4,600	7,410
Watts per capita		31	48

AVAILABLE GENERATING CAPACITY			
Utility system	kw		500
Industrial plants	kw		600
Under construction	kw		2,100
Total available capacity	kw		3,200
NEW GENERATING CAPACITY NEEDED			
During 1328-1332	kw	D1	2,000
During 1333-1335	kw	D2	4,000
Total new to end of 1335	kw		6,000
TOTAL			9,200
COST OF NEW CAPACITY			
During 1328-1332	thousand Rials		21,880
During 1333-1335	thousand Rials		37,450
Total to 1335	thousand Rials		59,330
Cost per kw	Rials		9,890
ALLOCATION OF COST			
For general distribution			
Residential, commercial and municipal per cent			42
Small industrial per cent			14
For large industrial per cent			44
AID FROM PLAN			
In thousand Rials			40,620
Per cent of total cost			69

Notes: D1 means one diesel set, D2 two sets, D3 three sets

No provision is included in either loads or capacities for irrigation

REMENTS OF 34 PRINCIPAL CITIES AND MINOR CITIES

	1						
PAHLEVI 30,000		KAZVIN 50,000		ZENJAN 35,000		ARAK 61,000	
1332	1335	1332	1335	1332	1335	1332	1335
30,000	31,000	57,000	60,000	35,000	36,000	64,000	66,000
750,000	1,390,000	1,420,000	2,700,000	520,000	900,000	1,600,000	2,970,000
25	45	25	45	15	25	25	45
250,000	460,000	430,000	810,000	160,000	270,000	480,000	890,000
1,000,000	1,850,000	1,850,000	3,510,000	680,000	1,170,000	2,080,000	3,860,000
33	60	32	59	19	32	32	58
23	23	25	25	28	28	25	25
1,230,000	2,050,000	2,310,000	4,390,000	870,000	1,490,000	2,600,000	4,820,000
31	35	31	35	29	32	31	35
450	670	850	1,430	340	530	960	1,570
15	22	15	24	10	15	15	24
90	90	900	900	50	50	150	150
130	–	1,700	–	100	–	1,000	–
–	230	–	2,200	–	200	–	1,300
670	990	3,450	4,530	490	780	2,110	3,020
22	32	60	75	14	22	33	46
100		150		50		200	
100		700		40		100	
–		–		–		300	
200		850		90		600	
D2 600		D3 3,000		D2 600		D2 2,000	
D1 500		D1 1,000		D1 300		D1 1,000	
1,100		4,000		900		3,000	
1,300		4,850		990		3,600	
8,050		29,340		7,700		19,940	
5,440		9,200		3,440		9,100	
13,490		38,540		11,440		29,040	
12,260		9,640		12,380		9,680	
60		26		53		35	
20		8		16		11	
20		66		31		54	
8,010		26,500		6,700		19,690	
59		69		60		68	

umping

OSTAN

		2									
CITY		BABUL 37,000		SARI, SHAHI, BEHSHAHR 45,000		SAMNAN 25,000		GHUM 50,000		KASHAN 45,000	
Population Estimate for 1327											
YEAR		1332	1335	1332	1335	1332	1335	1332	1335	1332	1335
Population Estimate		39,000	41,000	48,000	51,000	25,000	26,000	53,000	55,000	47,000	50,000
GENERAL DISTRIBUTION LOADS											
Residential, commercial and municipal sales	kwh	1,170,000	2,130,000	1,440,000	2,650,000	380,000	650,000	1,390,000	2,400,000	940,000	1,850,000
Kwh per capita		30	52	30	52	15	25	22	37	20	37
Small industrial sales	kwh	390,000	710,000	420,000	790,000	110,000	200,000	460,000	800,000	280,000	550,000
TOTAL SALES	kwh	1,560,000	2,840,000	1,860,000	3,440,000	490,000	850,000	1,850,000	3,200,000	1,220,000	2,400,000
Kwh per capita		40	69	39	67	20	33	35	58	26	48
Distribution losses—percent		24	24	25	25	28	28	25	25	25	25
Plant output	kwh	1,930,000	3,520,000	2,330,000	4,300,000	630,000	1,090,000	2,310,000	4,000,000	1,520,000	3,000,000
Annual load factor—percent		31	35	30	34	29	32	30	34	30	34
Peak load	kw	710	1,150	890	1,140	250	390	880	1,340	580	1,010
Watts per capita		18	28	19	28	10	15	16	24	12	20
LARGE INDUSTRIAL NEEDS											
Present industrial needs	kw	100	100	5,550	5,550	550	550	900	900	1,300	1,300
Added industrial to year:		1,700	–	450	–	70	–	900	–	4,000	–
Added industrial to year:		–	2,000	–	850	–	140	–	1,200	–	4,250
TOTAL PEAK LOADS		2,510	3,250	6,890	7,540	870	1,080	2,680	3,440	5,880	6,560
Watts per capita		64	79	144	148	34	42	50	63	125	131
AVAILABLE GENERATING CAPACITY											
Utility system	kw	150		250		–		–		–	
Industrial plants	kw	100		4,500		350		700		1,100	
Under construction	kw	–		–		–		450		1,000	
Total available capacity	kw	5,000				350		1,150		2,100	
NEW GENERATING CAPACITY NEEDED											
During 1328-1332	kw	5,000	Steam and Lines			D2 600		D3 1,500		D4 4,000	
During 1333-1335	kw	5,000	Steam and Lines			D1 300		D2 1,000		D1 1,000	
Total new to end of 1335	kw	10,000				900		2,500		5,000	
TOTAL		15,000				1,250		3,650		7,100	
COST OF NEW CAPACITY											
During 1328-1332	thousand Rials	87,000				7,700		17,120		38,540	
During 1333-1335	thousand Rials	52,000				3,440		10,610		9,200	
Total to 1335	thousand Rials	139,000				11,140		27,730		47,740	
Cost per kw	Rials	13,900				12,380		11,090		9,550	
ALLOCATION OF COST											
For general distribution											
Residential, commercial and municipal per cent		24				38		29		17	
Small industrial per cent		7				12		10		5	
For large industrial per cent		69				50		61		78	
AID FROM PLAN											
In thousand Rials		77,940				6,920		18,550		33,600	
Per cent of total cost		56				62		67		70	

Notes: D1 means one diesel set, D2 two sets, D3 three sets
No provision is included in either loads or capacities for irrigation pumping

OSTAN

		3				4					
City		Tabriz		Ardebil		Rezaiyeh		Khoy		Marageh	
Population Estimate for 1327		205,000		60,000		50,000		36,000		30,000	
Year		1332	1335	1332	1335	1332	1335	1332	1335	1332	1335
Population Estimate		209,000	225,000	60,000	62,000	53,000	56,000	36,000	37,000	31,000	33,000
General Distribution Loads											
Residential, commercial and municipal sales	kwh	7,520,000	14,200,000	780,000	1,360,000	1,690,000	3,080,000	540,000	920,000	620,000	1,220,000
Kwh per capita		36	63	13	22	32	55	15	25	20	37
Small industrial sales	kwh	2,570,000	4,730,000	260,000	450,000	560,000	1,030,000	180,000	310,000	190,000	370,000
Total Sales	kwh	10,090,000	18,930,000	1,040,000	1,810,000	2,250,000	4,110,000	720,000	1,230,000	810,000	1,590,000
Kwh per capita		48	84	17	29	42	73	20	33	26	48
Distribution losses—percent		23	23	28	28	25	25	28	28	25	25
Plant output	kwh	12,400,000	23,300,000	1,330,000	2,440,000	2,810,000	5,140,000	920,000	1,570,000	1,010,000	1,990,000
Annual loan factor—percent		33	37	28	31	31	35	29	32	30	34
Peak load		4,290	7,200	540	900	1,040	1,680	360	560	380	670
Watts per capita		21	32	9	15	20	30	10	15	12	20
Large Industrial Needs											
Present industrial needs	kw	1,600	1,600	–	–	–	–	–	–	–	–
Added industrial to year:		2,600	–	150	–	300	–	50	–	100	–
Added industrial to year:		–	4,200	–	400	–	600	–	150	–	250
Total Peak Loads		8,490	13,000	690	1,300	1,340	2,280	410	710	480	920
Watts per capita		41	58	12	21	25	41	11	19	15	28
Available Generating Capacity											
Utility system	kw	1,000		100		130		–		50	
Industrial plants	kw	1,400		–		–		–		–	
Under construction	kw	800		–		–		–		–	
Total available capacity	kw	3,200		100		130		–		50	
New Generating Capacity Needed											
During 1328-1332	kw	D3 7,000		D2 1,000		D3 1,500		D2 600		D2 600	
During 1333-1335	kw	D2 6,000		D1 500		D2 1,000		D1 300		D1 500	
Total new to end of 1335	kw	13,000		1,500		2,500		900		1,100	
Total		16,200		1,600		2,630		900		1,150	
Cost of New Capacity											
During 1328-1332	thousand Rials	67,880		12,150		17,640		7,890		8,050	
During 1333-1335	thousand Rials	53,880		5,460		10,950		3,530		5,440	
Total to 1335	thousand Rials	121,760		17,610		28,590		11,420		13,490	
Cost per kw	Rials	9,370		11,730		11,440		12,690		12,260	
Allocation of Cost											
For general distribution											
Residential, commercial and municipal per cent		41		49		54		61		55	
Small industrial per cent		14		16		18		18		17	
For large industrial per cent		45		35		28		21		28	
Aid From Plan											
In thousand Rials		83,740		10,880		17,570		6,590		8,070	
Per cent of total cost		69		62		61		68		60	

Notes: D1 means one diesel set, D2 two sets, D3 three sets
No provision is included in either loads or capacities for irrigation pumping

OSTAN

		5						6			
City		Hamadan		Kermanshah		Sanandaj		Ahwaz		Dizful	
Population Estimate for 1327		105,000		100,000		32,000		50,000		48,000	
Year		1332	1335	1332	1335	1332	1335	1332	1335	1332	1335
Population Estimate		110,000	115,000	104,000	109,000	32,000	33,000	55,000	60,000	49,000	50,000
General Distribution Loads											
Residential, commercial and municipal sales	kwh	2,970,000	5,520,000	2,600,000	4,900,000	480,000	820,000	2,750,000	4,800,000	880,000	1,500,000
Kwh per capita		27	48	25	45	15	25	50	80	18	30
Small industrial sales	kwh	890,000	1,660,000	650,000	1,220,000	140,000	250,000	920,000	1,600,000	260,000	450,000
Total Sales	kwh	3,860,000	7,180,000	3,250,000	6,120,000	620,000	1,070,000	3,670,000	6,400,000	1,140,000	1,950,000
Kwh per capita		35	63	31	56	19	32	67	107	23	39
Distribution losses—percent		25	25	26	26	28	28	22	22	26	26
Plant output	kwh	4,820,000	8,970,000	4,100,000	7,720,000	790,000	1,370,000	4,480,000	7,800,000	1,440,000	2,460,000
Annual load factor—percent		31	35	30	34	29	32	32	36	30	33
Peak load	kw	1,770	2,930	1,560	2,590	310	490	1,600	2,480	550	850
Watts per capita		16	26	15	24	10	15	29	41	11	17
Large Industrial Needs											
Present industrial needs	kw	600	600	–	–	–	–	1,000	1,000	–	–
Added industrial to year:		450	–	1,750	–	80	–	500	–	150	–
Added industrial to year:		–	1,050	–	2,150	–	160	–	1,000	–	300
Total Peak Loads		2,820	4,580	3,310	4,740	390	650	3,100	4,480	700	1,150
Watts per capita		26	40	32	43	12	20	56	75	14	23
Available Generating Capacity											
Utility system	kw	480		400		50		2,500		50	
Industrial plants	kw	500		–		–		900		–	
Under construction	kw	320		160		–		–		–	
Total available capacity	kw	1,300		560		50		3,400		50	
New Generating Capacity Needed											
During 1328-1332	kw	D2 2,000		D3 3,000		D2 600		–		D2 1,000	
During 1333-1335	kw	D2 2,000		D2 2,000		D1 300		D2 2,000		D1 500	
Total new to end of 1335	kw	4,000		5,000		900		2,000		1,500	
Total		5,300		5,560		950		5,400		1,550	
Cost of New Capacity											
During 1328-1332	thousand Rials	20,240		29,630		7,780		–		11,880	
During 1333-1335	thousand Rials	18,490		18,580		3,470		19,740		5,330	
Total to 1335	thousand Rials	38,730		48,210		11,250		19,740		17,210	
Cost per kw	Rials	9,680		9,640		12,500		9,870		11,470	
Allocation of Cost											
For general distribution											
Residential, commercial and municipal per cent		50		38		57		18		56	
Small industrial per cent		15		10		17		6		17	
For large industrial per cent		35		52		26		76		27	
Aid From Plan											
In thousand Rials		25,190		32,080		6,650		13,860		10,690	
Per cent of total cost		65		67		59		70		62	

Notes: D1 means one diesel set, D2 two sets, D3 three sets

No provision is included in either loads or capacities for irrigation pumping

OSTAN

		6				7					
City		Burujird		Shushtar		Shiraz		Kazerun		Bushire	
Population Estimate for 1327		47,000		25,000		120,000		26,000		25,000	
Year		1332	1335	1332	1335	1332	1335	1332	1335	1332	1335
Population Estimate		48,000	49,000	26,000	27,000	126,000	133,000	26,000	27,000	25,000	25,000
General Distribution Loads											
Residential, commercial and municipal sales	kwh	960,000	1,710,000	470,000	810,000	4,410,000	8,540,000	360,000	620,000	450,000	750,000
Kwh per capita		20	35	18	30	35	65	14	23	18	30
Small industrial sales	kwh	290,510	510,000	160,000	270,000	1,470,000	2,850,000	110,000	190,000	150,000	250,000
Total Sales	kwh	1,250,000	2,220,000	630,000	1,080,000	5,880,000	11,390,000	470,000	810,000	600,000	1,000,000
Kwh per capita		26	45	24	40	47	86	18	30	24	40
Distribution losses—percent		26	26	26	26	23	23	28	28	26	26
Plant output	kwh	1,580,000	2,800,000	790,000	1,360,000	7,230,000	14,010,000	600,000	1,040,000	760,000	1,260,000
Annual load factor—percent		30	33	30	33	31	35	29	32	30	33
Peak load	kw	600	920	300	470	2,660	4,570	240	370	290	440
Watts per capita		13	19	12	17	21	34	9	14	12	17
Large Industrial Needs											
Present industrial needs	kw	–	–	50	50	1,500	1,500	–	–	500	500
Added industrial to year:		1,620	–	700	–	3,900	–	50	–	500	–
Added industrial to year:		–	1,770	–	800	–	5,200	–	100	–	600
Total Peak Loads		2,220	2,690	1,050	1,320	8,060	11,270	290	470	1,290	1,540
Watts per capita		46	55	40	49	64	85	11	17	52	62
Available Generating Capacity											
Utility system	kw	–		50		–		–		–	
Industrial plants	kw	–		100		1,200		–		400	
Under construction	kw	150		400		300		–		–	
Total available capacity	kw	150		550		1,500		–		400	
New Generating Capacity Needed											
During 1328-1332	kw	D5 2,500		D1 500		D4 9,000		D2 400		D2 1,000	
During 1333-1335	kw	D1 500		D1 500		D1 3,000		D1 200		D1 500	
Total new to end of 1335	kw	3,000		1,000		12,000		600		1,500	
Total		3,150		1,550		13,500		600		1,900	
Cost of New Capacity											
During 1328-1332	thousand Rials	27,870		6,550		84,890		5,170		11,640	
During 1333-1335	thousand Rials	5,330		5,330		26,150		2,300		5,230	
Total to 1335	thousand Rials	33,200		11,880		111,040		7,470		16,870	
Cost per kw	Rials	11,070		11,880		9,250		12,450		11,180	
Allocation of Cost											
For general distribution											
Residential, commercial and municipal per cent		24		8		32		61		27	
Small industrial per cent		7		2		11		18		9	
For large industrial per cent		69		90		57		21		64	
Aid From Plan											
In thousand Rials		22,430		8,090		79,800		4,350		11,390	
Per cent of total cost		68		68		72		58		68	

Notes: D1 means one diesel set, D2 two sets, D4 four sets, D5 five sets

No provision is included in either loads or capacities for irrigation pumping

OSTAN		8		9							
City		Kerman		Meshed		Sabzavar		Nishabur		Guchan	
Population Estimate for 1327		50,000		200,000		33,000		27,000		25,000	
Year		1332	1335	1332	1335	1332	1335	1332	1335	1332	1335
Population Estimate		51,000	52,000	210,000	221,000	34,000	35,000	28,000	29,000	26,000	27,000
General Distribution Loads											
Residential, commercial and municipal sales	kwh	820,000	1,460,000	7,350,000	14,370,000	610,000	1,050,000	500,000	870,000	520,000	950,000
Kwh per capita		16	28	35	65	18	30	18	30	20	35
Small industrial sales	kwh	250,000	440,000	2,450,000	4,790,000	200,000	350,000	170,000	290,000	170,000	320,000
Total Sales	kwh	1,070,000	1,900,000	9,800,000	19,160,000	810,000	1,400,000	670,000	1,160,000	690,000	1,270,000
Kwh per capita		21	37	47	87	24	40	24	40	27	47
Distribution losses—percent		27	27	23	23	26	26	26	26	25	25
Plant output		1,360,000	2,410,000	12,070,000	23,570,000	1,020,000	1,760,000	840,000	1,460,000	860,000	1,590,000
Annual load factor—percent		30	34	32	36	30	34	30	34	31	35
Peak load		520	810	4,310	7,480	390	590	320	490	320	520
Watts per capita		10	16	21	34	11	17	11	17	12	19
Large Industrial Needs											
Present industrial needs	kw	1,300	1,300	1,200	1,200	–	–	–	–	–	–
Added industrial to year:		2,100	–	1,900	–	100	–	100	–	100	–
Added industrial to year:		–	2,300	–	3,100	–	200	–	200	–	200
Total Peak Loads		3,920	4,410	7,410	11,780	490	790	420	690	420	720
Watts per Capita		77	85	35	53	14	23	15	24	16	27
Available Generating Capacity											
Utility system	kw	120		–		40		–		–	
Industrial plants	kw	1,300		1,500		–		–		–	
Under construction	kw	–		1,800		170		120		–	
Total available capacity	kw	1,420		3,300		210		120		–	
New Generating Capacity Needed											
During 1328-1332	kw	S2 4,200		S1 5,250		D1 500		D1 500		D1 500	
During 1333-1335	kw	–		S1 5,250		D1 500		D1 500		D1 500	
Total new to end of 1335	kw	4,200		10,500		1,000		1,000		1,000	
Total		5,620		13,800		1,210		1,120		1,000	
Cost of New Capacity											
During 1328-1332	thousand Rials	69,690		65,210		6,750		6,750		6,780	
During 1333-1335	thousand Rials	–		55,820		5,380		5,380		5,410	
Total to 1335	thousand Rials	69,690		121,030		12,130		12,130		12,190	
Cost per kw	Rials	16,590		11,530		12,130		12,130		12,190	
Allocation of Cost											
For general distribution											
Residential, commercial and municipal per cent		17		50		52		51		54	
Small industrial per cent		5		16		17		17		18	
For large industrial per cent		78		34		31		32		28	
Aid From Plan											
In thousand Rials		38,330		63,500		7,360		7,390		7,330	
Per cent of total cost		55		52		60		61		60	

Notes: S1 means one steam turbo-generator unit, S2 two steam units, D1 one diesel set

No provision is included in either loads or capacities for irrigation pumping

OSTAN 10

CITY / Population Estimate for 1327 / YEAR		Isfahan 200,000		Yezd 55,000		Najaf-abad 29,000		Capital Tehran 800,000		Total Principal Cities 2,911,000	
		1332	1335	1332	1335	1332	1335	1332	1335	1332	1335
Population Estimate		212,000	225,000	57,000	60,000	30,000	31,000	850,000	900,000	3,033,000	3,191,000
General Distribution Loads											
Residential, commercial and municipal sales	kwh	8,480,000	16,870,000	1,250,000	2,220,000	450,000	770,000	51,000,000	121,500,000	113,210,000	237,690,000
Kwh per capita		40	75	22	37	15	25	60	135	37	74
Small industrial sales	kwh	2,970,000	5,900,000	370,000	670,000	130,000	230,000	15,300,000	36,450,000	35,490,000	74,140,000
Total Sales	kwh	11,450,000	22,770,000	1,620,000	2,890,000	580,000	1,000,000	66,300,000	157,950,000	148,700,000	311,830,000
Kwh per capita		54	101	28	48	19	32	78	175	49	98
Distribution losses—	percent	22	22	25	25	28	28	22	22	23	23
Plant output	kwh	13,970,000	27,760,000	2,030,000	3,610,000	790,000	1,280,000	80,890,000	192,600,000	183,030,000	383,080,000
Annual load factor—	percent	33	37	30	34	29	32	33	36	32	36
Peak load	kw	4,840	8,570	770	1,210	310	460	27,980	61,070	65,160	122,660
Watts per capita		23	38	14	20	10	15	33	68	21	38
Large Industrial Needs											
Present industrial needs	kw	5,000	5,000	1,100	1,100	–	–	10,500	10,500	34,740	34,740
Added industrial to year:		4,200	–	3,800	–	100	–	11,000	–	47,150	–
Added industrial to year:		–	8,700	–	4,100	–	250	–	28,000	–	79,950
Total Peak Loads		14,040	22,270	5,670	6,410	410	710	49,480	99,570	147,050	237,350
Watts per capita		66	99	99	107	14	23	58	111	48	74
Available Generating Capacity											
Utility system	kw	–		400		50		12,000		18,820	
Industrial plants	kw	6,000		1,000		–		9,000		31,590	
Under construction	kw	12,550		700		–		2,000		23,320	
Total available capacity	kw	18,550		2,100		50		23,000		73,730	
New Generating Capacity Needed											
During 1328-1332	kw	–		D2 4,000		D2 600		S3 31,500		97,050	
During 1333-1335	kw	D2 6,000		D1 2,000		D1 300		S3 63,000		111,950	
Total new to end of 1335	kw	6,000		6,000		900		94,500		209,000	
Total		24,550		8,100		950		117,500		282,730	
Cost of New Capacity											
During 1328-1332	thousand Rials	–		40,740		7,740		274,000		1,034,190	
During 1333-1335	thousand Rials	54,230		18,970		3,460		452,000		929,740	
Total to 1335	thousand Rials	54,230		59,710		11,200		726,000		1,963,930	
Cost per kw	Rials	9,040		9,950		12,440		7,680		9,400	
Allocation of Cost											
For general distribution											
Residential, commercial and municipal	percent	43		6		48		47		40	
Small industrial	percent	15		2		15		14		12	
For large industrial	percent	42		92		37		39		48	
Aid From Plan											
In thousand Rials		36,930		43,890		6,770		143,190		934,600	
Per cent of total cost		68		74		60		20		48	

Notes: D1 means one diesel set, D2 two diesel sets, S3 three steam turbo-generator units

No provision is included in either loads or capacities for irrigation pumping

ELECTRIC POWER REQUIREMENTS FOR MINOR CITIES

New Generating Capacity		
During 1328-1332	kw	3,280
During 1333-1335	kw	4,920
Total new to end 1335	kw	8,200
Cost of New Capacity		
During 1328-1332	thousand Rials	39,360
During 1333-1335	thousand Rials	59,040
Total to 1335	thousand Rials	98,400

Exhibit L-2

ESTIMATE OF COMPARATIVE COSTS AND PERFORMANCE FOR VARIOUS SIZES AND TYPES OF GENERATING UNITS

Rating and Type of Units	Station Output Net Peak (Kilowatts)	Investment Per KW Of Output (Rials)	Operating Cost Other Than Fuel (Rials Per KW-Year)	Average Fuel Rate (Kcal per kwh)
Steam				
2,000 kw, 32 kg				
Initial Unit	2,100	16,400		
Second Unit	2,100	13,900	895	4,500
Two Units	4,200	15,150		
5,000 kw, 43 kg				
Initial Unit	5,250	11,100		
Second Unit	5,250	9,600	475	3,800
Two Units	10,500	10,350		
10,000 kw, 43 kg				
Initial Unit	10,500	9,200		
Second Unit	10,500	8,100	295	3,700
Two Units	21,000	8,650		
20,000 kw, 60 kg				
Initial Unit	21,000	8,150		
Second Unit	21,000	7,150	225	3,200
Two Units	42,000	7,650		
Diesel				
300 kw, 428 rpm				
Initial Unit	300	14,200		
Second Unit	300	11,500	3,000	3,200
Two Units	600	12,850		
500 kw, 375 rpm				
Initial Unit	500	13,100		
Second Unit	500	10,700	2,100	2,900
Two Units	1,000	11,900		
1,000 kw, 333 rpm				
Initial Unit	1,000	10,950		
Second Unit	1,000	9,200	1,380	2,750
Two Units	2,000	10,075		
2,000 kw, 231 rpm				
Initial Unit	2,000	10,700		
Second Unit	2,000	9,300	810	2,850
Two Units	4,000	10,000		
3,000 kw, 167 rpm				
Initial Unit	3,000	10,000		
Second Unit	3,000	8,800	610	2,750
Two Units	6,000	9,400		
5,000 kw, 167 rpm				
Initial Unit	5,000	9,600		
Second Unit	5,000	8,600	410	2,750
Two Units	10,000	9,100		

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR ELECTRIC POWER

In Thousands of Rials

	1328—Second Half			1329			Remaining 5½ Years			Total		
	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total
Total Budget for Central Station Program (Plan and Private Financing)												
First Stage (1328-1331)	23,490	52,590	76,080	65,240	118,710	183,950	282,210	531,310	813,520	370,940	702,610	1,073,550
Second Stage (1332-1335)	–	–	–	2,240	4,910	7,150	316,810	664,820	981,630	319,050	669,730	988,780
Total	23,490	52,590	76,080	67,480	123,620	191,100	599,020	1,196,130	1,795,150	689,990	1,372,340	2,062,330
Portion of Central Station Program to be Privately Financed	23,490	12,290	35,780	67,480	19,550	87,030	599,020	343,630	942,650	689,990	375,470	1,065,460
Portion of Central Station Program Included in Plan Budget										Total Plan Allocations		
Utility power supply for residential, commercial, public buildings, street lighting and similar general use	–	11,580	11,580	–	30,880	30,880	–	224,080	224,080	–	266,540	266,540
Utility power for industrial purposes	–	28,720	28,720	–	73,190	73,190	–	628,420	628,420	–	730,330	730,330
Total	–	40,300	40,300	–	104,070	104,070	–	852,500	852,500	–	996,870	996,870
Special Projects in Plan Budget												
Two mobile power plants mounted on railroad trucks	100	5,200	5,300	150	4,550	4,700	–	–	–	250	9,750	10,000
Diesel rehabilitation survey	700	400	1,100	–	–	–	–	–	–	700	400	1,100
Distribution system investigations	1,000	810	1,810	500	490	990	–	–	–	1,500	1,300	2,800
Electric rate investigations	500	490	990	600	650	1,250	–	–	–	1,100	1,140	2,240
Total	2,300	6,900	9,200	1,250	5,690	6,940	–	–	–	3,550	12,590	16,140
Total Plan Allocations for Electric Power Development	2,300	47,200	49,500	1,250	109,760	111,010	–	852,500	852,500	3,550	1,009,460	1,013,010

EXHIBIT M-1

U. S. S. R.

U. S. S. R.

TURKEY

CASPIAN SEA

IRAQ

AFGHANISTAN

PAKISTAN

SAUDI ARABIA

PERSIAN GULF

GULF OF OMAN

OMAN

I R A N

Shahpur
Ardebil
TABRIZ
Urmia
Rezaiyeh
Maragheh
Mianeh
RESHT
Mahabad
Chalus
Babul
Shahi
Bandar Shah
Gurgan
Shahrud
Sabzavar
MESHED
Kazvin
TEHRAN
Samnan
Kavir Khurian
HAMADAN
Ghum
Darya-i-Namak
KERMANSHAH
Araq
Kashan
Burujird
Khorramabad
Ab-i-Kavir
Birjand
Naiin
ISFAHAN
Dizful
Yezd
AIOC
Ahwaz
Khorram-shahr
Abadan
Bandar Shahpur
Kerman
Zahidano
OSHIRAT
Sirjan
AT TAWAL
KUWAIT
Bushire
AIOC Concession
Dowlat-abad
Bampur
Bandar Abbass
HORMOZ
STRAIT OF HORMUZ
Chahbahar

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

LEGEND

Region	Location
①	Caspian Belt and Northern Khorassan
②	Dasht-i-Kavir
③	Southern Makran
④	Strip adjoining AIOC Concession
⑤	Sistan and Dasht-i-Lut
⑥	Northern Makran
⑦	Azarbaijan
⑧	Marine

KILOMETERS
0 50 100 150 200
SCALE

REGIONS OF PROBABLE OIL INTEREST

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

D577. ,IRAN.
Report on seven year development plan for the plan organization of the Imperial Government of Iran.
New York, Overseas Consultants, 1949. 5 v.

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REPORT ON

SEVEN YEAR DEVELOPMENT PLAN

FOR THE

PLAN ORGANIZATION

OF THE

IMPERIAL GOVERNMENT OF IRAN

VOLUME V

ORGANIZATION

STATISTICAL ORGANIZATION

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OVERSEAS CONSULTANTS, INC.
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ORGANIZATION

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ORGANIZATION

GENERAL

INTRODUCTION

Much of the success of the proposed program for social and economic reform will depend upon the Plan Organization which is established for its administration and execution.

While technical skill, financial and other resources and a general sense of freedom in the exercise of individual initiative have had much to do with the development of a prosperous economy in all industrialized countries, no single factor has been so important as the evolution in the art of management which has made possible the effective co-ordination of all other elements.

The administrative problems which face those responsible for the Seven Year Plan are difficult. To expect a successful outcome of this Plan it is necessary to presuppose a Plan Organization in which each person and agency is placed in correct relationship with each other and with persons and agencies outside the Plan Organization itself. Each essential function must be defined and correctly allocated. Procedures must be fixed to connect these separate functions in such a way that the cumulative power of the Organization is directed toward the designated objectives. Responsibilities and related authorities must be explicitly defined and assigned in order to energize and control the entire administrative mechanism.

It should be possible to create such an organization in Iran as well as elsewhere. It cannot be done quickly but if undertaken properly it can be done rapidly enough to permit the Plan to advance as fast as other limiting conditions will permit.

If an effective Plan Organization is to be established it will be necessary to set aside many considerations which are irrelevant to the success of the Plan, however important or convenient they may appear from other points of view. The selection and appointment of personnel for the key positions is one of the vital points in the creation of the Organization. The structural form of the Organization, the arrangements made for decentralization, the definition and assignment of functions, responsibilities and authority, must all be approached with the sole aim of creating the most effective means of executing the objectives of the Plan. Otherwise it can be expected to fail.

Broadly speaking, we envisage the Plan Organization as consisting basically of the three agencies established by the law (High Council, Managing Director and Board of Control) with a fixed staff of Iranians under them, appropriate in qualification and number to perform or supervise the functions of the Plan, which can be expected to continue throughout the seven year period. To this basic organization will be added from time to time, and for whatever period is necessary in each case, qualified personnel transferred from other Government institutions into the Plan Organization for the purpose of collaborating in the preparation of particular projects or parts of the Plan program. Normally, men thus utilized in the preparation of projects should accompany the project, when approved, through its execution stage in whatever agency it is placed for implementation. Through such an arrangement the permanent (i. e. seven-year) personnel of the Plan Organization itself would be kept at a minimum, the fullest possible use would be made of all specially qualified men in all Government departments, and the agency having final responsibility for the operation of the com-

pleted project would have the advantages which come from the participation of its own men in the preparation of the Plan projects.

We envisage also, however, that deficiencies will be disclosed at all levels of the Plan Organization in experience and special skills which are required for the successful operation of the Plan. These may be remedied in several ways.

On the lower level of actual execution of Plan works, a deficiency will exist in the grades of foremen and of semi-skilled and skilled artisans. This should be made up by securing qualified men from abroad who will train Iranians in these grades. On higher levels deficiencies will exist, particularly in experience, in the ranks of technical men and trained executives. These deficiencies likewise can be remedied by employing directly into the Organization concerned qualified men from abroad. Here again, Iranians will receive the additional training which is essential to the continuing success of the program. At the highest level the Managing Director and the High Council will find it advantageous to have close to them a body of expert consultants upon whom they can call both for guidance in technical or other matters and for arranging whatever other services are needed from the more technically advanced and more highly industrialized countries of the world.

In addition to the deficiencies in personnel there are others which are less readily recognizable but equally important. Chief among these is the lack of a definitive arrangement for bridging the gap between the Plan Organization and the established institutions of the Government. There are also deficiencies in the existing means of executing the projects formulated by the Plan Organization. These are of many kinds and each one must be remedied appropriately. In some cases existing agencies can be used effectively as they are; in others they must be strengthened or modified; in still others new agencies must be created and at the proper time transferred to the appropriate permanent establishment.

Much of the work necessary under the Plan will be performed by private enterprises, and the Plan Organization must relate its activities with those of the private investors and operators of the country. Among these are the Iranian contractors who must be developed as one important means of executing Plan works. Among them also are the private investors and contractors from abroad who will have important parts to take in the program.

One other broad field of problems that the Plan Organization must be prepared to recognize is the effect which the diverse activities of the Plan will have on the economy of the country.

The foregoing brief comments will make clear our reasons for recommending utmost care in establishing the Plan Organization upon which the success of the Plan so largely depends.

It is an empty truism to say that such an organization should be simple. The great number and diversity of existing agencies with which the Plan Organization must collaborate presents a very complicated set of conditions into which the new Organization must be fitted. The wide variety of new functions which the Plan Organization is charged to perform adds to this complexity. More than either of these, however, the basic concept of the Plan implies the necessity for reforms and the introduction of new administrative techniques which preclude any expectation of real simplicity in establishing an organiza-

tion for the execution of the program. The works envisaged by the Plan and the national benefits which are objectives of the Plan are strikingly different from the social and economic practices which have characterized Iranian culture for ages.

The real requirement is that the new Organization be effective. According to the best informed opinion many of the long-established methods of administration in Iran will not be effective in producing the results which are envisaged in the Plan. This requires that new administrative methods be introduced. It is also intended that the new administrative agencies be Iranian, not alien. This necessitates that foreign assistance be sought at all levels of the Organization where present deficiencies exist, in order to train Iranians in techniques new to them.

Progress in the new directions must take place uniformly, or nearly so, in all divisions of the national economy, so that the advancing economy will remain integrated, with each part serving and being served by all the others. This requirement necessitates, on the one hand, that not too much be undertaken at any one time in any one particular field or it will be pushed ahead of the surrounding developments which it must serve and which must be served by it. Cement production, for example, need not and should not be pushed too far ahead of the capacity of consumers to purchase and use it, or of railroad or other transportation facilities to distribute it. To this extent the necessity for moderation in the rate of particular developments simplifies many of the problems which face an advancing economy. On the other hand, the same necessity for uniform advancement vastly increases the diversity of undertakings which are required simultaneously to advance the economy along its entire front at a more or less uniform rates. Thus a single project to develop agricultural production in a particular region requires not only agricultural technology but measures to control malaria, roads to serve the new areas, water development for irrigation, vocational schools to train the new types of labor which are needed, financial institutions to make loans to farmers and a developing system of distributing and marketing agencies to dispose of the increased commodities produced.

Manifestly, an administration which has as its aim the sound evolution of an old and deeply rooted economy into a modern one based upon quite different principles, cannot be simple. The nature of the undertaking makes it complex. What can be done, however, is to proceed slowly in the early stages, allowing each new function and agency to find its proper place and the economy as a whole to adjust itself to each new pressure which is put upon it before vigorous additional steps are taken.

Failure to recognize the vital importance of sustained and uniform progress over the entire social and economic front has caused repeated failures in the efforts of economically backward countries to improve their conditions. It is far easier, and more spectacular, to thrust ahead with technological achievements which do not raise the basic standard of living within the country, than it is to change the way of life of the people themselves. Nevertheless it is this latter objective at which Iran's Seven Year Plan is aimed. It cannot be realized by merely awarding contracts to foreigners for the creation of modern factories or duplicating other advanced features of western modernization.

To summarize what has been said, the administrative Plan Organization required for the accomplishment of the Plan cannot be a simple one, for its task is highly complex; but the problems arising out of its complexity can be met in a practical way by beginning with basic essentials and advancing no more rapidly than the agencies of improvement can be developed nor faster than the social and economic structure of the country can be

strained without ripping it apart. If the latter happens, as it has in other countries, the technological achievements may leap ahead, but the social and economic foundations of the country may collapse.

PLANNED ECONOMY NOT THE OBJECTIVE

The function and, therefore, the form of the administrative Organization depends upon the Plan objectives. Some of these are stated explicitly in the law and others are clearly enough implied. One basic objective, however, must be clarified and kept constantly in mind in organizing for the work as well as in carrying out the program. The essential point here can perhaps best be expressed by saying that the objective of this program is not to produce a planned economy, in the sense in which that term has come to be used in recent years, but to bring about conditions under which a free economy can develop along modern lines. A free economy, in the sense used here, does not mean one in which no controls or restraints are imposed by the Government. It does mean, however, that as far as possible at each developing stage of the country, individuals will be encouraged and assisted to produce and to sell at a profit what consumers wish to buy and are able to pay for. It means that consumers will be free to choose for themselves what goods and services they wish in exchange for their own money, and what services they choose to offer to others to earn their money. Such limitations as are placed by law upon individual freedom under such a system are clearly necessary in the public interest, and are not derived from any theory of regimentation by persons in bureaucratic positions. If foreign exchange, for example, is not sufficient to meet all demands made upon it, then certain controls over its use are necessary. Other controls may be necessary from time to time to avoid or limit black markets, excessive interest rates, and monopolistic or other restrictive trade practices. Such controls have been developed to a point, however, where they are a normal part of most successful free economies. What has been said is enough to indicate that the general objective of the present Plan is not to tend toward a planned economy in the currently accepted sense, but on the contrary to evolve, out of the present low level and far from free economy, an advancing one which will depend ultimately upon private individual initiative operating as freely as is consistent with the public interest.

It seems necessary to state the foregoing understanding of general policies as a premise for our recommendations concerning organization and administrative procedure. Otherwise the conspicuous part which the Government must take initially to energize the dormant segments of the economy may be mistaken, even by the Iranians themselves, as the beginning of a regime of state socialism aimed at producing a planned economy. If such a misunderstanding should become prevalent within the Plan Organization itself, it would bring about a gradual stifling of private enterprise and a drying up of the sources of individual initiative, particularly at the level of top management and important private investment. This might not become readily noticeable for some years, by which time expanding state operations and bureaucratic control agencies might have reached a point that would make a reversal of policy difficult or impossible.

A real intention to encourage a free economy will be evidenced by a vigorous effort to encourage and assist individual enterprise of all types which will contribute to a rising general standard of living within the country. This will include the transfer of Government-built factories, for example, to private ownership as rapidly as private investors are ready to take them over. It will include provisions for enterprising peasants to own their farms and gradually to adopt new practices which enable them to increase their

purchasing power, and with it new and better ways to spend their increased incomes. It will include training programs which teach new skills on the lower levels, thus enabling awakening ideas of personal and family betterment to implement themselves, instead of remaining passive instruments in some great and incomprehensible Government institution.

The task is to set up not a bureaucracy for control but an instrument for creation. If this be in fact the objective of the Plan then it should be understood by everyone, and the functionaries who execute the program must take each opportunity to guide it in this direction.

RELATIONSHIP BETWEEN PLAN AND OTHER ORGANIZATIONS

The outstanding feature which characterizes, and perhaps even justifies, a Plan Organization separate from the organizations which execute the works of any program, is the co-ordination which is made possible by such an arrangement. Co-ordination, in this sense, means bringing into harmony all of the factors which affect a given situation, regardless of how these factors happen to be distributed among particular administrative divisions.

Thus, for example, in analyzing the problem of textile production it is futile to attack this from the single viewpoint of the particular administration in charge of Government-owned textile factories, because the real problems have their sources elsewhere. They include problems of cotton, wool and silk production, labor economics, distribution and marketing, credit facilities, foreign exchange and many others, including those relating to the successful conduct of private business. No single Government administration is in a position to deal with all these problems. Nevertheless the problem of successful textile manufacture is merely the summation of all these individual problems.

Similarly, when a solution to the textile problem is found, its implementation will require actions to be taken by many agencies which come under entirely different administrations. All of these must operate in unison to bring about the desired result. Their co-ordination can be effected only by some agency which has the entire situation within its view.

The Plan law recognizes three basic functions in connection with the economic development program.

1. Preparation of plans for projects.
2. Supervision of their execution, including responsible control of Plan funds.
3. Execution of the approved program of works.

In principle the law places the first two functions in the Plan Organization and the third in ministerial or other Government institutions and, when appropriate, in private enterprises. The law recognizes also that, if the planning and supervisory function is separated from the function of execution, close and mutual co-operation among the agencies concerned becomes essential. In the variety of circumstances which will arise, rigid rules cannot take the place of mutual co-operation in deciding how a particular situation can best be dealt with. Even with complete willingness to co-operate, however, certain principles must

be established as general guides toward most effective accomplishment of Plan purposes. We recommend the adoption of such principles, among which are the following:

1. The primary purpose of the Plan is to accomplish certain approved social and economic benefits; therefore only those agencies which in the opinion of the Plan Organization are capable or can be made capable of satisfactorily executing approved projects can be considered acceptable as agencies for execution.

2. Subject to principle 1, existing agencies of the Government should be utilized for the execution of Plan projects in preference to creating new Government or Plan agencies for the purpose, but if no adequate agency exists, or exists only nominally, then the Plan Organization may make other provisions for execution, subject to principle 3.

3. When the Plan Organization finds it advisable to establish a new agency under its own administrative authority for the purpose of executing an approved Plan undertaking, and when the function performed is permanent and appropriate for Government administration, the aim of the Plan Organization should be to develop the new agency to a point which insures its effective accomplishment of the plan objective and then, at an appropriate time, to transfer the new agency into the permanent organization of the Government.

4. When the Plan Organization finds it advisable to create a new Government-owned company for the purpose of executing a particular project which has been approved as part of the Plan program, the supervision of such company should remain under the Plan Organization until, in the opinion of the Plan Organization, it can advantageously be placed under the supervision of a permanent Government agency.

5. When the Plan Organization finds it advisable to perform a certain approved project by contract, instead of by using its own organization or that of another Government agency, it shall negotiate, execute and supervise the contract and shall operate or supervise the operation of the completed project until, in its opinion, the operation can advantageously be placed under the supervision of a permanent Government agency.

6. The ultimate mutual aim of the Plan Organization and of all other Government agencies should be progressively to reduce the necessary functions of the Plan Organization to the preparation of soundly-conceived programs, and the co-ordination of the administrative and executive agencies which are responsible for putting them into effect. This desirable aim will be achieved most promptly if the most capable men in the administrative and executive agencies of the Government will participate in and collaborate with the Plan Organization and undertake to improve existing or create new Government agencies capable of efficiently performing the agreed-upon programs, with due regard to the part which should be taken by private undertakings of all appropriate kinds.

THE PLAN ORGANIZATION AS A SELF-LIQUIDATING INSTITUTION

One point must be clarified before the outline of organizational form and administrative practice described here will appear in the light intended. This is our belief that the chief purpose in creating a Plan Organization and empowering it to act as the law describes, is to enable conditions to be studied and appraised, and programs of improvement to be formulated, in an atmosphere as free as possible from the political pressures and exigent considerations which characterize government administrations in any coun-

try, not alone Iran. This seems to us to have been a wise provision, indeed a necessary one. Our approach is that a new function, that of planning, has been isolated for development, and that when and as developed it will be reabsorbed by existing institutions or by new ones added to them. Personnel, as far as possible, will be borrowed from established departments and, according to the law, will prepare co-ordinated programs for accomplishing the objectives of the Plan. While on this planning work they will be aided by such experts as are required, and will accompany each new undertaking as it passes from planning to execution and permanent operation under its appropriate division of the Government administration.

From this principle it follows that, in a manner of speaking, the present Plan Organization, except for its top staff, is a self-liquidating institution. It should be prepared to transfer its functions to established Government agencies as rapidly as such functions can be assumed with assurance of effective performance. Because the Plan administration has been made responsible for the successful outcome of the Plan program, it must be the judge as to when any particular project can be turned over to another institution.

REFORM AS A PLAN OBJECTIVE

The Seven Year Plan is essentially a program of economic reform or, perhaps better, of social reform through economic improvement. In its beginning stages the direct operations of the Plan Organization are limited to formulating and supervising a program of works which will be executed in part by existing agencies without undertaking the reform of those agencies. Ultimately, to achieve many of the Plan's objectives it will be necessary to bring about radical changes in institutions and practices which are outside the present jurisdiction of the Plan. In the beginning, however, it will be necessary to accept many limitations in the scope of the Plan's work in order to bring the undertaking within what is practicable to achieve. Later the limitations can be removed progressively as the necessity for expansion becomes clearly evident. Even from the beginning it is clear, however, that some reforms outside the Plan itself are imminently needed and that provision must be made in the Plan Organization for preparatory work in those fields. Examples of this are provisions made in the proposed Organization for an early analysis of the private banking and credit systems of the country, and for a thorough study of the tax laws and practices. Related examples are found in the recommendations that several new agencies, which should be established as parts of the permanent Government administration, be created under the Plan and subsequently transferred to their proper place.

The intention in showing such developments as part of the Organization recommended here is to indicate its organic and evolutionary character. Such an organization must be designed to grow in whatever new directions are necessary as conditions change, and gradually as it matures to merge into the permanent institutions of the Government on the one hand and of private enterprise on the other.

One of the principles which has guided our recommendations concerning the development of a Plan Organization is that the most successful reforms are likely to be those which transform an existing institution or condition of the economy gradually into a form better suited to the advancing aims of the country. It is seldom that a real reform can be made by an abrupt substitution of a new regime for an old one. Most long-estab-

lished practices which are important enough to become subjects of national reform have at the same time so many threads of national life woven into them that reform by elimination and substitution will result in unnecessary and unintended disruption of vital processes in the national life. Unless the need is critically urgent, reform through evolution is to be preferred.

It does not follow that guided evolution of a bad practice into a good one is necessarily a slow process. It may be the quickest. Very often the experience, judgment and intimate familiarity acquired through years of practice, however obsolete, inadequate or even corrupt, can be guided into new channels with better results than can be hoped for if a completely new start must be made.

Among the Government institutions which, according to the law, should take part in the execution of the Seven Year Plan projects, unquestionably some will start reorganizing their own faculties in preparation for such work as soon as the men in charge find out what new work is to be performed and what changes in their own organizations appear advisable. Such voluntary efforts to parallel the reforms explicitly provided for within the Plan, in Government agencies outside its present jurisdiction, are of course commendable. To the extent that members of Government agencies have been working closely with those engaged in preparing the new plans, some degree of co-ordination might be expected between the Plan program and the voluntary reorganization of Government agencies and practices.

For several reasons, however, mere willingness to co-operate is not enough. Ministers in responsible charge of Government agencies are frequently changed, which makes continuity of policy impossible. This engenders a philosophy of short range expediency among the permanent staff which is inimical to organization as we are using the term. We are nevertheless confident that wherever a Minister and his principal assistants have a real desire to collaborate with the Plan Organization, the reforms which are necessary within his group of agencies can be brought about reasonably promptly.

This will be done chiefly in two ways. First, if Ministers will see to it that as many as possible of the most able men within their Ministries are made available to the Plan Organization, for long or short periods, to take part in the preparation of detailed projects within the field of the Ministry concerned, these same men can return to the Ministry well prepared for the execution stage of the project. Second, if the Plan Organization prepares a project for execution within the jurisdiction of a Ministry and demonstrates on that one job the value of good organization, competent supervision, skilled craftsmen, and modern construction methods, at least the good men who take part in this endeavor will favor it as standard practice. Most men prefer to do work well rather than to do it badly. Even those who cling to the benefits accruing to them under the old system of Government administration will at least weigh the prospect of a new system replacing it and some will decide that their chances are better in the new direction.

The device of inducing reforms in administrative agencies outside the Plan by arranging to execute carefully organized and competently supervised projects, large or small, within the normal jurisdiction of a Ministry, can be likened to the process of straightening a crooked hole by thrusting a straight stick through it. Many opportunities to exercise such a device will be found, and if it be done often enough and at all levels a uniform orientation will have been given to whatever tendency exists toward administrative reforms outside the Plan.

Another type of reform mentioned earlier is less subject to the direct influence of the Plan than are the operating practices of the Ministries. This includes modernization of some of the more basic institutions, such as the legal, educational, tax, land-holding and private banking systems of the country. We are concerned here only with such aspects of reform as affect the Plan Organization. In almost every case, however, the necessity for some reform can be foreseen as prerequisite to the accomplishment of Plan objectives. Also, in almost every case it is possible to take some measures during the early stages of the Plan which will at least point the way that evolutionary improvements should take.

Many operations under the Plan will necessitate new laws or modification of existing ones. Examples are a new law providing for the orderly expropriation of private land for public purposes, without which it would be impossible to execute important water development, road improvement and other projects; and a new law conveying oil concession rights to the Government-owned company which the Seven Year Plan law stipulates be created for oil development purposes. In all such cases the necessary laws should be drafted with the new national aspirations represented by the Plan in mind, and not merely as a means of overcoming a technical legal obstacle. The guidance of such new legislation is a Plan function of high importance, and provision for its most effective performance must be made in the Plan Organization.

In the field of education Plan objectives are concentrated around the development of vocational skills. In the longer view, however, vocational training as applied to agriculture, industry and other essential services is not a matter of training hands but of training minds, and cannot be dealt with in isolation from the educational system of the country. The weight which we attach to this subject is reflected in the detail with which it has been treated elsewhere in this report (Vol. II). It is reflected again in the provisions made in the Plan Organization which we recommend.

Similar principles applied in other fields have led to corresponding functions which are implicit in the mandate of the Plan. In agriculture the most advanced technology will fall short of Plan objectives under an archaic land-tenure system. The growth of industry cannot proceed, whatever the engineer's skill, under a taxation system which belongs to another age. Private enterprise will never develop until the banking and credit system of the country enables the formation of capital for the production of new wealth and services, and not solely for the enrichment of the money lender. A Plan Organization which fails to foresee these needs, and to provide for improvement at the proper time and rate in each of these directions, will fail also in its other purposes, for they cannot stand alone.

CERTAIN PRINCIPLES OF EFFECTIVE ORGANIZATION

THREE BASIC ASPECTS

Form

The general form of an organization is determined largely by the pattern which is adopted for distributing responsibility and for delegating authority. Thus in the typical military organization the pattern is essentially a triangle with the commander-in-chief at the apex and unbroken lines of authority successively dividing the supreme authority among smaller and smaller divisions to the lowest rank which exercises command. In a typical, modern, commercial organization, on the other hand, the use of semi-autonomous

agencies (such as subsidiary companies) and policies of decentralization will produce an entirely different pattern. Many years of trial and error have shown that there are practical limitations to the freedom with which such patterns can be drawn, and that certain types are best adapted to certain conditions.

Many considerations must enter into the determination of the organizational pattern. These include the relative weight which is to be given to authority in the sense of the mandatory or compulsory power which characterizes a military organization, and to authority in the sense of making independent decisions based upon the exercise of individual judgment. In the present case, the ultimate responsibility which is placed on the High Council and Managing Director for accomplishing the Plan objectives and for properly employing the funds made available for that purpose indicates the necessity for certain lines of authority extending from the High Council and Managing Director to every element of the Plan organization. On the other hand, the diversity of problems which must be solved under changing and unpredictable conditions, and the geographical dispersion of the work itself, indicate that many decisions must be left to the judgment of those who are closely in touch with controlling conditions, and that many others must be made by persons who are geographically isolated from the central authority. The organizational pattern in the present case is drawn with these facts in mind.

Functions

The functions of an organization are determined by its objectives. In practically no case is even the simplest objective accomplished by the direct application of authority, skill or force to the initial situation. In the normal case the desired result is simply the last one of a sequence of changing conditions. The corresponding sequence of actions necessary to produce the final objective is the function which must be performed by the organization.

Since the functional aspect of an organization is a highly important one, the point will be illustrated by an analogy. If the operator responsible for a certain chemical plant desires to make a specific change in the character of the product flowing from it he does not apply his effort directly to the product itself. Instead he adjusts a valve which changes the quantity of flow in an early stage of the process, which in turn brings about a change in temperature at another stage which produces a change in pressure elsewhere, with the end result that the final product itself is changed to the new specification. To make this possible the engineer who designed the plant must have provided operating and control mechanisms which would perform every necessary function to bring the process into equilibrium under the changed condition produced when the operator adjusted the valve. The operator, in turn, must know that, to produce a desired change in the end result, he need only apply his direct action at a single point and that every necessary subsequent action will follow in the correct measure and sequence.

In an executive organization the controlling action is represented ordinarily by a decision to produce a certain end result. Every function essential to that objective must be known and provision for it made in the organization so that the essential sequence of actions will follow, ending in the result desired. No break in this sequence is permissible, or the necessary subsequent operation will not be performed. If an instruction is ignored, or a drawing not completed on time, or an order for material not placed, or an essential decision not made, the sequence of necessary actions is broken and the objective is lost. These essential functions are not determined primarily by the form of the organization.

They represent the things which must be done, in a certain sequence, if the chain of operations which ends in the objective is to be complete.

Almost equal in importance to determining and providing for the essential functions is the avoidance of unessential functions. Experience has shown that it is even more common practice to stop the sequence of essential operations by diverting them into unnecessary bypaths than by failing to provide for a step which is essential. Common examples are, among others, requiring a multiplicity of approvals, duplicating operations, referring questions or decisions to others unnecessarily, diluting individual responsibility through the excessive use of committees, and requiring and circulating unecessary copies of papers.

In the Plan Organization the wide range of objectives means that a great many functions must be analyzed and defined. Many of these, however, are common to an entire group of objectives. Many others will fall within the competence of members of the Organization to determine for themselves. Our present recommendations aim only to indicate the principal types of functions which must be performed and to emphasize that all essential functions must be determined, defined and executed, or final objectives will not be reached.

It is emphasized also that the number and type of persons required in any organization are determined by the functions which must be performed. Once qualified persons have been assigned to the performance of essential functions, the organization is complete. Any personnel in addition merely increases the risk of confusion, procrastination and diversion into bypaths.

Personnel

No fallacy is more common than that "the organization depends upon the men who compose it". Whatever general truth this statement may contain, the fact remains that, assuming personnel of average competence to be available, the form of the organization and the functions which must be performed by it are almost completely independent of the men who compose it at any particular time. An organization based upon the theory of the "indispensable man" is not an organization at all in the sense the term is used here.

The form pattern of the organization and the flow of functions through it represent continuous systems, whatever number of partitions the organization may contain to divide one of its elements from another. The qualifications of a particular man are important only in determining which and how many of the functions he can perform. The usual organization chart is misleading in suggesting that individuals occupy boxes in isolation from their colleagues. A truer picture would be to represent them as occupying zones or areas of a continuous organizational pattern. An experienced man may occupy a zone of responsibilities and perform a group of functions which would have to be divided between two less experienced successors, or alternatively the borders of adjoining zones might be extended to reduce the burden upon his successor. Individual qualifications are important, therefore, in assigning men to duties within the organization, but not in determining either the form or the functions of the organization itself.

It should be unnecessary to say that men should not be permanently assigned to positions or duties within an organization except in accordance with their qualifications to discharge the functions involved. From this it follows that the essential functions must be determined and defined before permanent assignments can properly be made.

To comply with these latter two principles in forming a completely new organization, the necessity of tentative assignments must be recognized. An initial organization is necessary for the purpose of developing the conditions which will determine its further growth. In an expanding organization this process will be a continuing one as the field of operations is extended.

RESPONSIBILITY AND AUTHORITY

One of the conspicuous features of modern management as it has been developed during the past fifty years of industrial progress has been the recognition that responsibility for every important decision or operation must be clearly fixed and defined, and that it must be delegated appropriately by superiors to subordinates in the organization. Thus each person in the executive system from top to bottom is assigned explicitly defined and limited responsibilities which he must exercise himself. In this manner an executive at any level is spared the burden of dealing with affairs which can equally well be disposed of by his subordinates.

An essential corollary to this principle of assignment and delegation of definite responsibilities is the allocation of authority commensurate with responsibility. Nothing can more completely paralyze the effective operation of an organization than to require that all decisions be made by the top man. Generally speaking, the nearer the top of an executive organization, the greater will be the proportion of executive attention which should be devoted to policy determination and broad planning, leaving to subordinate executives the making of decisions and the execution of works necessary to accomplish the results.

If men are lacking in the experience and judgment which are necessary to assume such responsibilities and exercise commensurate authority at each level, the lack must be made up by training and by supplying expert assistance until these qualities are developed. The mistake must not be made of accepting such lack as permanent, and attempting to create a successful organization in which all responsibility and authority resides in the top man.

In the Organization which we recommend here it is assumed that these qualities can and must be developed, but that during the development period supplementary experience will be required at all levels of the work.

DECENTRALIZATION

The function of planning, including the conduct of studies and the approval of programs of work, budgets and policies, must be centralized under the immediate control of the responsible Plan authority. Otherwise it would be impossible to apply uniform judgment concerning the relative importance or priority of the projects proposed for Plan action. Also, without such centralization, it would not be possible to co-ordinate the many factors which, unless considered in their total effect, might interfere with or prevent the realization of Plan objectives. General policies which serve as guides for the conduct of Plan activities as a whole must likewise emanate from a central source of authority.

On the other hand, many of the functions involved in actually carrying out the approved and co-ordinated program can be decentralized and assigned for execution to agencies which have a high degree of independence. The degree of independence which

is permissible will depend upon circumstances, but the aim should be to make it as high as is consistent with reasonable assurance that the final result will be satisfactory.

One advantage of decentralization is that of delegating executive authority wherever practicable, as a means of relieving higher authorities of a needless burden. Two other reasons, however, apply more particularly to decentralization itself.

The first is that, once the factors essential to co-ordination have been dealt with by the central authority, the remaining factors which determine the successful completion of the work require an ability to form sound judgments based upon intimate familiarity with current conditions and to make effective decisions leading to action. It is essential that limitations be defined within which such decentralized operations may be conducted without nullifying the provisions for co-ordination which have been made by the central authority.

The second is that in decentralization of execution, particularly important in the present case, the wide geographical dispersion of proposed plan activities, with inadequate communication facilities, would make it practically impossible to exercise effective executive control over local details from a central headquarters.

An added advantage of geographically decentralized control will come from the increased use of local personnel in the Plan Organization itself and the feeling among the people of the country that the Plan has a close association with their region and welfare instead of being a remote activity of the central Government.

The general principles discussed in the following paragraphs apply, of course, to the delegation of executive responsibility and authority wherever decentralization is practiced.

DISTRIBUTION OF EXECUTIVE BURDEN

It has been said that an experienced executive can direct the operations of as many as three independent divisions under him, and that, if exceptionally capable, he might extend this to four. Without pausing to appraise the axiomatic value of this statement we can accept as a general truth the fact that the broader the field over which any executive must spread his attention the less he can be expected to know about any part of it. By an "executive" we mean a person who is responsible for the conduct and outcome of certain operations, and who is empowered to make decisions which control those operations within the limits and in accord with the general policies fixed by a higher authority. Obviously if he is to make decisions he is expected to know enough about the prevailing circumstances to be reasonably sure that certain consequences will follow those decisions. The practical limit of the executive field which he can cover effectively, therefore, is fixed by the information he requires to make decisions with assurance. In any particular case this will depend largely upon the capacity and experience of the man himself.

In large modern organizations, however, executives are often called upon to direct operations of which they have no detailed or specialized knowledge. In such cases a second principle applies. If the executive is assured that his subordinate knows the facts and conditions upon which the outcome depends, it is not essential that it be known again by the senior executive. What he requires is assurance that all relevant facts and conditions have been taken into account by the men below, along with any policy directions from above, and authority to make the actual decision can be delegated to the subordinate.

In practice it is necessary to provide certain aids and checks to gain full value from this delegation of authority. These are of several usual kinds:

1. A current report to the senior executive from each junior to whom he has delegated authority, stating what has been done under that authority and the circumstances, will serve as a basis for criticism and for at least minimizing the consequences of an error in judgment if one has been made.
2. Standing instructions to juniors to refer all exceptional cases to the senior for decision will protect against the likelihood of error from this cause.
3. An occasional thorough check of all details which entered into a junior's decision in some particular case may disclose weaknesses in his judgment or procedure which can be safely corrected.

Another device for assuring effective administrative control with a minimum of executive effort is the use of standards of procedure and performance. A procedural standard fixes the action to be taken in certain typical circumstances. A standard of performance defines the results which will be considered acceptable. Standards of these kinds have special value when a particular type of function is recurrent in its essential character. The regulations discussed elsewhere in this section are an example of procedural standards.

The foregoing discussion suggests some of the ways in which the executive burden can be distributed by the delegation of authority. In addition to relieving senior executives of minor administrative functions, in many situations well-informed juniors will make sounder decisions than poorly-informed seniors.

Through successive delegations at all levels of the organization, the authority to make decisions and the responsibility for carrying them through can be placed in the hands of the lowest executives who can assure successful performance, instead of in those of the highest. The top management is thus freed of detail and can devote its attention to major problems or to dealing with exceptional cases.

The time saved by making decisions as near as possible to the point where they are to be applied, in terms of organizational procedure, is likely to be one of the greatest benefits derived from the modern management practice described here. Moreover, this is the only way in which junior executives can be trained for higher positions.

COMMITTEES

One of the obstacles most frequently placed in the way of effective executive action is the committee. A committee in an administrative organization may be valuable as a means of securing information and opinion as a basis for determining a policy or course of action. It may be valuable also as a convenient means of co-ordinating various actions which are not all under the control of a single executive. It is seldom if ever valuable as an executive agency, i. e. one which must bear responsibility for directing a sequence of actions upon which the outcome of an operation depends.

The essence of executive action is making decisions. This is not a function to which a committee is well suited. In practice a committee decision is likely to be either that of a single individual who dominates it, or a compromise to which the weakest member is prepared to subscribe.

The greatest weakness of a committee is the dilution of individual responsibility it engenders. Where no particular person can be held responsible for a delay, or for a wrong decision or for no decision at all, the effectiveness of any organization is likely to stop. This point is very often reached when the chain of action reaches a committee.

In the Plan Organization we recommend in this report committees are provided for the two purposes first mentioned, namely for counsel and for co-ordination, but not for executive action. Even when a committee is warranted for some particular reason it is wise to make the chairman himself responsible that necessary action be taken.

In deciding whether or not to provide a committee instead of placing the function in a single person, two points should be kept in mind. First, a committee of five men consumes five times as many man-hours for each conversation, interruption or delay as does a single person. Second, unless the men appointed to a committee because of their value as counselors or their authority to achieve co-ordination actually attend in person, the committee is likely to be useless. The practice of sending unqualified alternates or those without real authority can quickly destroy any value the committee might have had.

DESCRIPTION OF THE RECOMMENDED ORGANIZATION

GENERAL

The type of organization recommended here is based upon the principles mentioned earlier, applied to the conditions which we believe might reasonably be expected as the work of the Seven Year Plan develops. It is not intended that the Organization described here be adhered to rigidly. Its details must be regarded as tentative until the conditions which control them actually develop. The rate at which the work progresses, the sequence of important projects, the degree and character of collaboration with other Government institutions, the progress made in acquiring executive experience, the extent of foreign contract work and many other factors will combine to determine the internal arrangement and the functions which are best suited to each stage of the developing program.

It seems wise to us, however, to outline here a complete Organization, capable of successfully performing every function which can now be foreseen as necessary to the accomplishment of Plan purposes. It should serve as a general guide, from which departures can be made whenever sound reasons appear for making them.

TOP MANAGEMENT

What is commonly referred to in large modern industrial organizations as "top management", that is, the board of directors with its auxiliary agencies, is represented here by the High Council, the Managing Director and the Board of Control.

The legal powers, responsibilities and functions of each of these three bodies are described in the law. The complete text of the Seven Year Plan law is included in this report as Exhibit 2 (Vol. I), but the principal relevant provisions may be summarized as follows:

> "The Plan Organization shall be composed of a High Council, a Board of Control and a Managing Director." (Article 9)

"The duties of the Plan Organization shall be:

"'To prepare plans and projects, detailed budgets, . . . to supervise the execution of the operations included in the Plan from the technical and financial points of view and to oversee the co-ordination and co-operation of the executory agencies.'' (Article 8)

"The Council is to undertake the approval of plans, projects and budgets . . . also the compilation of rules and regulations, and the approval of agreements; and in general is charged to oversee the fulfillment of all the duties for which the Plan Organization is responsible.'' (Article 9)

"The Managing Director shall be appointed . . . by Royal Decree upon the proposal of the Government; . . . The Managing Director shall head the technical office and subsidiary departments of the Plan Organization; he shall represent the Plan Organization vis-a-vis the Government and Ministries and is in general responsible for the proper execution of the duties for which the Plan Organization is charged.'' (Article 9)

"The execution of the development plan in matters relating to finances and accounting and in respect of foreign exchange transactions and the conclusion of contracts and agreements shall be subject to special rules and regulations which the High Council shall draw up in consultation with the Board of Control, to assure maximum expedition, economy in expenditure, and the best results; these rules and regulations shall be put into effect upon their approval by the Council of Ministers.'' (Article 10)

From the standpoint of effective administration, however, the provisions of the law offer a difficulty at the outset. It is a fundamental principle of sound organization that responsibility and commensurate authority go hand in hand. The law appears to violate this principle at the highest level by placing responsibilities for the successful execution of the Plan directly upon the Managing Director, while reserving for the High Council (and others) certain authority without which the Managing Director may be unable to discharge his responsibilities.

Two solutions are available. Either the High Council should be made fully responsible for the successful outcome of the Plan, within the legal and financial means put at its disposal, in which case the Managing Director, while still deriving from the law the security of his appointment, would be subordinate to the High Council in responsibility and authority; or the Managing Director should be made responsible for preparing such plans and projects as either agency may propose, submitting them to the High Council for its approval, and then executing those which are approved, independently of the High Council but within the financial and other limitations which were made conditions of the approval.

The distinction between these two solutions should be made quite clear. According to the first solution the High Council is fully responsible and has complete authority except that it cannot remove the Managing Director, and must exercise its function of implementing the program through him. Such an arrangement is not uncommon in successful organizations and has certain advantages. The security of his appointment gives the Managing Director an independence which enables him to act as a check on the executive activities of the High Council, and it concentrates executive authority in one person insofar as that part of the Organization below him is concerned. This can work very effectively, but also it can easily result in partial or complete blocks in the operation of the Plan. In the latter case some change in personnel would be necessary.

According to the second solution, the Managing Director might be compared to a contractor with the High Council as his client. The Managing Director would be responsible for the preparation of plans and projects, and for the execution of such of them as were approved and for which funds were made available by the High Council, but he would not be responsible for deciding which ones should be done. The High Council, representing the Government, would be fully responsible for deciding which projects should be undertaken and for providing the funds necessary to carry them out, but after releasing them to the Managing Director it would be relieved of responsibility for their successful execution during that phase of the work. In this solution the total responsibility for the outcome of the program envisaged by the law would be divided at the outset between the High Council and the Managing Director. To make this arrangement effective all relevant authority must be similarly divided. The High Council, for example, must not be empowered to appoint or remove personnel within the organization upon which the Managing Director must rely for the discharge of his responsibilities, nor must the High Council interfere in any other way with any activity which the Managing Director deems necessary to achieve the objective assigned to him.

Under such an arrangement, where the High Council acts for the Government in deciding what projects shall be undertaken as part of the Seven Year Plan and providing the funds for them, and the Managing Director undertakes to bring those projects to completion as prescribed in the law and in accord with such other terms as may have been agreed upon with the High Council, it is still possible that conflicts will occur between the two agencies. This appears much less likely, however, than under the first solution. For example, when a project is to be released by the High Council to the Managing Director for execution, questions may arise as to the practicability of performing it at a particular time or for the sum of money proposed, or concerning the relationship it bears to some other Government agency. Any such questions, if they are vital to the project, should be regarded as essential parts of the project itself and until they have been agreed upon the responsibility for its completion cannot be transferred from the High Council to the Managing Director. This would be analogous to the situation where a client arranges with a contractor to execute a specifically defined project under agreed-upon terms and thereafter not interfering with the contractor during the completion of the work.

The organization described herein is based upon our recommendation that the second of the solutions discussed above be adopted as representing the intention of the law. It is emphasized, however, that no doubt whatever must be left as to the basic division of responsibility and authority between the High Council and the Managing Director. Once this is clearly understood many subordinate questions relating to administrative jurisdiction can be dealt with by agreement as they arise. It must also be made clear where the responsibility of the Managing Director ends, upon the completion of his part of the work, and upon whom any remaining responsibility rests. If the High Council is responsible for the selection and approval of the projects which achieve the aims of the Plan, it follows that the High Council should decide what the ultimate disposition of the project is to be. In one case, for example, the project may terminate in a power plant which must be turned over to a permanent agency for operation. The High Council must decide what agency is to assume the operating responsibility and at what point or at what time it is to be transferred. All such understandings should be included in the "contract" between the High Council and the Managing Director.

We have three reasons for recommending that the second of the solutions discussed above should be adopted to clarify the relations between the High Council and the Managing Director:

1. We believe it is better from the standpoint of clear-cut organization, i.e. less confusion will arise under the second arrangement than under the first.

2. We believe that the selection and co-ordination of economic projects to be undertaken by the Government should be a permanent function, ultimately applying to the work of the Ministries and other Government institutions as well as to that of the Seven Year Plan Organization. With this in mind it is better to define the responsibilities of the High Council in such a way that its appraising and co-ordinating function is independent of the particular agency which performs the projects.

3. We believe that questions and perhaps disputes as to the jurisdiction of various Government agencies, including the Plan Organization itself, are inevitable and that the High Council, because of its composition, is in a better position to deal with such questions than is the Managing Director, who is concerned chiefly with the technical aspects of implementing the Seven Year Plan itself.

The position of the Board of Control in the Plan Organization seems fairly clear from the law. Briefly it is charged with responsibility for observing all activities under the Seven Year Plan and disclosing any conditions which, in its opinion, are not in harmony with the objectives of the law. To enable this responsibility to be exercised it is authorized to have free access to all relevant sources of information, but without authority to interfere directly in any activities of the Plan. However, from the extract quoted from the Seven Year Plan earlier in this section apparently some clarification of the law will be necessary to give assurance that the responsibility of the Board of Control is adequately defined.

MAIN BODY OF ORGANIZATION

In broad outline the organization which we recommend consists of the Managing Director, three Directors in charge of the three principal types of functions (Administration and Finance, Technical Services and Agriculture and Social Services), and 19 Managers, each of whom is in direct charge of a group of closely related functions.

The three Directors are considered necessary to enable the Managing Director to delegate a large part of his responsibility, thus permitting him to devote attention to collaboration with the High Council.

Each Director, in turn, will delegate much of his responsibility to the managers under him, thus permitting him to collaborate with the Managing Director, and to co-ordinate the activities of the three principal divisions.

The pattern of the organization below the Managers cannot be described so simply. From this point on various agencies must be provided to perform the types of functions assigned to each Manager. In some cases these functions will be performed by individuals reporting directly to the Manager. In other cases a single function will require a considerable organization of its own, under a supervisor reporting to the Manager.

The functions which must be performed under the Managers will include the study and preparation of proposed projects and also the measures necessary to bring approved projects to completion through whatever agency has been designated for that purpose.

It should be noted that in the form of organization which we recommend here, responsibility for all three of the steps just mentioned, i.e. investigation, preparation and execution (or supervision) of projects, has been brought together under the Manager concerned. This is believed to be essential under the conditions which prevail in Iran today. Later, after effective organizations have become established both inside and outside the Government for services and operations of various kinds, this continuity of responsibility may not be required. For the present, however, we believe that the success of any project will be far better assured if a single Manager has it under his supervisory control from its inception until it is ready to be turned over to a permanent agency in finished condition.

The requirements of decentralization as discussed earlier in this section are met in two ways. Purely administrative decentralization, which is simply an extreme form of delegated responsibility and authority, is secured by transferring the execution function to an agency which is practically autonomous, as for example to a Ministry, or to a joint stock company whose board of directors assumes responsibility for subsequent performance. Geographical decentralization is achieved by creating Regional Plan Centers (described later) from which as much as is practicable of the Plan operations in the adjoining area is supervised.

The general consultants who are engaged to assist the Plan Organization as a whole by providing expert and experienced counsel wherever it may be needed are attached for administrative purposes to the office of the Managing Director. They are, of course, available to the High Council for consultation at all times and to other institutions, inside or outside the Government, as arranged by the Managing Director.

PRINCIPAL DIVISIONS

The foregoing composite picture of the organization as a whole is shown graphically in Exhibit N-1, and in tabular form in Appendix N-1. Exhibit N-1 also shows the relation between the Plan Organization and other authorities. The geographical decentralization which we recommend is described later. The internal form of the supervisory sections and executing agencies will be so varied, according to circumstances, that each one of them will require separate consideration as the organization develops.

The designation "Managing Department" is applied here to each of the principal organizational units which reports directly to a Director. The number and composition of these Managing Departments is not necessarily fixed as shown in Exhibit N-1 and Appendix N-1, nor will they necessarily remain the same during different stages of the Plan program. At least until the Plan work is well started, however, we recommend that the list as shown be fairly closely followed.

It is obvious that not all the Departments listed in Exhibit N-1 and in Appendix N-1 will be of equal importance. Each Department shown, however, represents a group of functions which must be performed if the program is to be successful.

Within each Department the work assigned to it must be subdivided and assigned, as necessary, to supervisors who, with such staff assistants as are required, will proceed

with its execution. In some cases, where adequate executing agencies are already in existence, the organization required under the Manager concerned may be very small. It even may be that during certain stages of the Plan program all the current work in his field of responsibility will be performed by other agencies either within or outside the Plan Organization, and his own duties will be solely those of supervision and taking corrective action when deficiencies in execution are discovered.

In accord with the general principles already discussed (under Form, Functions and Personnel) the dividing lines between Departments, or between the supervisory subdivisions, may be changed to redistribute the current burden of work or to accommodate the capacities of the persons placed in charge. Such internal readjustments are required in all organizations and to discern their necessity is one of the important functions of management. As explained earlier this does not change the basic pattern of the organization.

The reasons for providing certain of the organizational divisions recommended here will not become clear until the various functions which must be performed to insure the success of the Plan have been described. In connection with that description (Functions of the Plan Organization) certain additional aspects of the organizational form which are intimately related to the function itself are discussed. This applies particularly to the form of new executing agencies which must be created because none, or no adequate ones, exist at present. An example is the Plan purchasing department. Both its relation to the other parts of the Plan Organization and its own internal organization are determined almost entirely by the nature of the functions which it must perform.

REGIONAL CENTERS FOR PLAN EXECUTION

For the purpose of extending the basic services of the Plan to the people at large, as well as for realizing the technical advantages of decentralized execution discussed earlier, we propose that regional plan centers be established in each ostan capital. In some cases developments or local circumstances may warrant more than one in certain ostans.

For practical reasons we recommend that these centers be regarded as regional rather than being identified too strictly with the particular ostan in which they are located. This is because the work of the Plan is concerned with conditions and projects which are more closely related to communities of people and to physical aspects of the country than to the political administration which defines the ostan. In many cases a particular area and the projects which pertain to it will be far more accessible to the center in the adjoining ostan than to the one in its own political capital. Projects which overlap two or more ostans must be directed from the most advantageous local headquarters. Transportation and other communications must be taken into account when fixing the center from which any particular project is to be directed.

Our concept of a Regional Plan Center is an extremely simple one. No pretentious quarters or organization is contemplated. We envisage rented space, if none is available in present public buildings, adequate to meet the office requirements of local project supervisors, agricultural specialists, public health supervisors and local contract supervisors, practically all of whom would normally spend their time in the field. Attached or convenient to such office quarters would be appropriate space and facilities for the storage and maintenance of locally required material and equipment.

In the beginning the functions performed through Regional Plan Centers would be simple, consisting chiefly of studying local conditions and acquainting the people with the

aims and projects of the Plan. As the program develops, which necessarily will be along different lines in the different localities, these activities will increase. Public health and sanitation, farm services, vocational training, local road improvement and other simple rural development activities are likely to be undertaken first. Demonstration services in these fields, and in village renovation, will stimulate popular interest and confidence in the Plan. Local committees may be formed to improve Plan representation in towns and villages.

Later, more extensive projects may involve water development for domestic and irrigation supply, electric power supply, development of new land for agriculture, provision of agricultural machinery and of construction equipment for local contractors, and extension of credit, which will necessitate expansion of Regional Plan Center organization and facilities.

Generally speaking, the supervisors in charge of the various types of services, including foreign specialists, necessarily would need to be sent from Tehran where they would receive preliminary training. The effort, however, should be to develop local people to perform as many as possible of the Regional Plan Center functions.

We see definite advantages in organizing the first Regional Plan Center near Tehran in the locality of the Near East Foundation operations. Arrangements could be made, we believe, for collaborating with that organization for training and demonstration. This would also make it possible to develop many of the techniques which will be required to accomplish Plan objectives in other provincial areas, under the convenient direction of the central Plan office in Tehran. Supervisors assigned to later work in the provinces could receive their training here. Candidates for similar training could be brought from the provinces for a period in the Tehran Regional Plan Center. This would serve also for the orientation of foreign specialists in rural types of work.

FUNCTIONS OF THE PLAN ORGANIZATION

INTRODUCTION

We have made no attempt to catalog and describe all the functions or even all the important ones which must be performed to insure the success of the Seven Year Plan. What we mean to do is to emphasize the fundamental importance of approaching the problem of organization from the viewpoint of the functions which the organization must be prepared to perform. A function in this sense is a type of recurring operation which advances any undertaking toward its completion.

Too often an organization is regarded solely in its static aspect, as an aggregation of titled positions ranged according to salary or prestige. Unless each unit in such an organization has a definite and essential operation to perform it is useless. From the functional point of view an organization as a whole, and each part of it, should be regarded as a mechanism through which a task can be passed from station to station until by the shortest practicable route it emerges in completed form. The operations which must be performed at each station are the functions discussed here.

Major functions can be subdivided progressively to determine the operations essential at each level of the organization and within each of its units. This is necessary in order to assign or to delegate responsibility and authority.

A frequent source of ineffectiveness in an organization is the attempt to assign responsibility, or the anxiety to assume authority, before the function to which it should apply has been defined. Responsibility, and particularly authority, which is not attached to an explicitly defined function through which it can be exercised, is emasculated of all meaning.

The major functions of the Plan Organization are described in the Seven Year Plan Law. These may be summarized briefly as follows:

1. To make such investigations of existing conditions as will disclose needs of the kinds which the Seven Year Plan is intended to remedy.
2. To prepare plans which, within the scope of the Plan and the provisions of the law, will best provide these remedies.
3. To take such steps as are necessary, within the provisions of the law, to put these plans into effect.

While, generally speaking, only the major functions of the Plan Organization are defined in the law, the obligation to perform every subsidiary function which is essential to the Plan objectives is implicit. The first duty of those responsible for the execution of the Plan is to find out what these functions are and to make provision for their performance. Otherwise the Plan will fail in its purpose.

INVESTIGATING NEEDS

To learn the needs of the country, within the intention of the Plan, requires comprehensive, detailed and continuing investigation. To make a single survey or occasional surveys is not enough. Not only do conditions change, but, as general surveys disclose areas of important needs, closer studies become necessary to narrow down the problem. As remedies are applied, continuing study is required to find out what new problems have been created or what obstacles exist.

Many manifestations of need will be found to have their sources in unexpected quarters, and studies will have to be diverted to those causes before effectual remedies can be applied.

To carry on these studies some auxiliary services will be required, such as statistical analysis, testing laboratories and experimental work. Expert assistance will be required for certain types of investigations.

In many cases investigation of needs and the determination and application of remedies will go on concurrently, for practical reasons, but from our present point of view it is emphasized that the investigation of conditions and the appraisal of needs must be kept in advance of the preparation of plans and of their execution. We must diagnose before we prescribe or administer remedies.

The functions of investigation must be clearly recognized and provided for regardless of how they may be combined with other functions for administrative or practical reasons.

In almost every division of the recommended Plan Organization agencies have been provided for investigative purposes and the general nature of their functions indicated.

The first duty of each man assigned in charge of such a division should be to analyze his field and define the functions which must be performed and contributed by his unit of the Organization.

PREPARING PLANS

As needs are disclosed by the investigations just dicussed the sequence of essential functions passes to the task of finding remedies. This general function can be broken down for procedural purposes into the following:

Consideration of all the available remedies
Elimination of those obviously less desirable
Analysis of those which might be desirable
Selection of the one best for the purpose
Elaboration of the one selected for execution.

The foregoing functions will, of course, be widely distributed throughout the Plan Organization. Corresponding functions will at the same time be exercised in many other agencies, both Government and private, wherever ideas concerning projects available for Plan assistance may originate.

For the purpose of illustrating the analysis which should be made of each important Plan function, the fourth step named above, selection of the action best suited to the purpose, will be examined in greater detail. From the standpoint of the High Council it is apparent that a key decision is involved here. The other functions listed may be performed by any agency, but this one contains the essence of the High Council's responsibility. The decision, therefore, can be made only by it. To be certain that its decision is sound, however, the High Council must know that the three functions which precede final selection have been correctly performed. Since they may have been executed by any one or more of many possible originators of the proposal, such assurance requires a central check which applies uniform criteria to all proposed projects. This uniform review enables the High Council to appraise at once the value and relative importance of each project proposed. Without such a central and standardized check, any number of irrelevant considerations might be advanced to influence or persuade the High Council, masking both the absolute and the relative value of the proposal.

This check of relative value alone, however, is not enough to guide the High Council's decision. It must also be assured that, if approved, the project can be executed at the time required, within the funds available and with the executing facilities which can be applied to it. Otherwise the decision to proceed with the project will be fruitless. To give this assurance, the central review just discussed must at the same time check with the other agencies concerned to establish the facts which determine the practicability of execution within the limits imposed by projects already under way or by other controlling conditions. With both these assurances before it, the High Council can apply its own judgment and discharge its responsibility by approving or rejecting the proposal.

For the High Council itself to undertake this central task of review and co-ordination in all its detail would be quite impracticable. At the same time to omit any one of the steps just described would require the High Council to act irresponsibly or to evade

the consequences of making an uninformed decision by taking no action at all. The correct solution is to provide an organizational mechanism which the High Council can be assured will operate with technical precision to perform certain definite functions and lay the results before the High Council. All that will be required in addition is the final judgment that only the High Council can supply.

Means of performing the functions just described are provided in the Department of Review and Co-ordination. The review and co-ordination function is made the responsibility of a Manager. The Department is placed under the Director of Administration and Finance, both because it is closely related to the financial administration of the Plan and to avoid placing it under either of the other two Directors whose work it will be reviewing.

The function of review and co-ordination is subdivided under the Manager. The critical analysis through the application of uniform criteria is assigned to one supervisor and the work of co-ordination to another. In both cases a small staff of well-qualified and carefully-selected assistants is necessary. While these two functions may appear complicated at first sight, a careful study of the following description will show that the actual detail is quite simple.

The project review function consists of subjecting each proposed project to a series of simple questions aimed at disclosing its real purpose and justification. If the sponsor of the proposal cannot answer the questions, he is obliged to secure the needed information. As all proposed projects are submitted to the same tests, their relative value and priority can be quite closely judged. Very often these tests will disclose that some part of a proposed project is urgently important whereas the remainder of it should be deferred or rejected completely. The competent exercise of this review function is of the highest importance to those who must make the final decision concerning a project. It can be performed by competent juniors in the Organization after a short period of training under a person with experience in this type of work. One of its most important effects is the increased attention which will be given to the initial preparation of projects, once it has been learned that every proposal to spend Plan money must pass this standardized review before it will be approved.

Because of the vital importance of the type of reasoning involved in this project review function, the essential steps through which a proposed project should pass immediately before final action on it is taken are described here in some detail.

Proposals for projects within the scope of the Plan and involving the expenditure of Plan funds may originate in any division of the Plan Organization or in any agency of the Government, or may be proposed by the consultants or by others. In all cases the proposal should be developed initially only in detail sufficient to enable a decision to be reached as to whether it should be approved or disapproved. This will avoid much waste of time and expense on the elaboration of designs or other details of projects which are not to be executed. The information necessary at this stage includes a general description of the project, the reasons for doing it, and the approximate cost and supporting statistical or other evidence enabling an independent appraisal of its justification. A uniform method of summarizing and presenting such information should be adopted insofar as this is practicable.

All proposals for Plan projects involving an expenditure above a certain minimum to be fixed by the High Council should be presented first to the Manager of Review and

Co-ordination, who will submit them for analysis by his project review staff. This staff should consist of a small group, perhaps four or five, including men with technical, economic and operating qualifications, especially selected for their ability to analyze objectively. They will call upon others, including available foreign experts, as required. Their functions include the following:

1. Prepare regulations fixing the form and content of proposals for expenditure.
2. Instruct and assist as necessary in the correct preparation of such applications.
3. Check each proposal submitted with particular reference to the following points.
   a. Precisely what are the objectives of the proposed work?
   b. Are the benefits claimed primarily social or primarily financial?
   c. What is the assurance that the benefits claimed will actually be realized?
   d. What would be the consequences if the project were not carried out?
   e. Is every part of the proposed work essential to the asserted objective?
   f. What part of the benefit claimed could be realized by doing only part of the project?
   g. How long will it take to get the benefits claimed?
   h. If part of the benefit is financial, how long will it take to repay the cost?
   i. In what other ways, and at what cost, could part or all of the benefits be gained? Why is the proposed way the best?
   j. Is the estimate of cost sufficiently accurate to serve as a sound basis for approval or disapproval of the project?
   k. Are estimates of operating costs reliable? Upon what are they based?
   l. What assumptions have been made? Are they vital to success? Are they reasonable?
   m. What risks exist which might prevent the benefits from being realized? What safeguards have been or can be taken?
   n. Is the proposed project complete in itself or must some other new project, or additional work, be provided to produce the benefit?
   o. Is any existing equipment (such as buildings or machinery) to be used in this project? What is its value? Can any existing equipment be utilized to reduce the new cost?
   p. What effect would the proposed project have on existing facilities or services (such as railways, power supply, competing concerns)?
   q. To what extent is this project essential to or dependent upon other proposed (not existing) projects? Have such projects been approved?
   r. Is any public nuisance or hazard involved?
   s. What would be the over-all effect of this project upon the broad economy of the country?

4. Request such additional information as may be needed from the originator.
5. Consult with experts or experienced men as necessary to check or secure information.
6. Summarize findings, with recommendations, and forward to the Appropriation Committee (or Managing Director) for action.

The function which remains to be performed after the technical review just described, and before final approval or disapproval, is to supplement the technical review by a high-level review aimed at judging the proposal from the standpoint of the Plan as a whole. It should embrace such considerations as the following:

1. What is the relative importance of the project in comparison with others?
2. What priority should be accorded, if approved?
3. Is the general argument sound or are there motives which do not appear in the exposition?
4. Does the proposal conform to the objectives of the Plan and the provision of the law?
5. Is the Plan budget adequate to undertake the project?
6. Are important political or public issues affected?
7. What issues may arise with other Goverment agencies and how will they be resolved?

Whether this function will be performed by the High Council itself, or whether a committee should be formed under the High Council or under the Managing Director, will depend largely upon how the High Council actually operates in practice. If the High Council devotes its attention effectively to achieving practical Plan objectives there is no reason for providing another committee to apply high-level judgment to such matters as have just been mentioned. If, on the other hand, the High Council conceives its duty to be limited, in practice, to stamping a project with its approval or disapproval, and to devote its own principal attention to dealing with the Council of Ministers, Majless or the public, then most certainly a working Appropriation Committee will be needed to assist its decisions. If needed, such a committee should be composed of the Managing Director and a small group including his Directors and selected Managers.

The co-ordination function consists essentially of two parts, scheduling and assignment. The scheduling function consists of extracting, from the data supplied with each proposed project, all the factors which might be critical in determining the practicability of executing it under the conditions which can be foreseen. These will include, for example, the monthly requirements of money (both rials and foreign exchange), of skilled and common labor, of special construction equipment (which might be engaged on other work), of tonnage to be received through a port or to be transported by railway, or of engineering time required for design. These predicted requirements are then examined in relation to a master schedule which shows similar requirements for all Plan undertakings, and the proposed project is scheduled for execution in such a way that all its essential requirements can be met without conflicting with other operations. All the information necessary for the performance of this scheduling function is available from the initial proposal, as it must have been estimated for the purpose of justifying the project in the first place. The sched-

uling operation is merely an intelligent utilization of such information in order to anticipate critical requirements and to co-ordinate the demands of various undertakings.

The assignment function merely places responsibility for the execution of work upon the appropriate agencies, and gives notification to all other agencies which might be affected (e. g. the budget, engineering, purchasing, transportation and personnel) that they will be called upon to perform certain related services during the period indicated. An important part of this assignment function is the liaison which must be maintained between this agency and all other agencies which are involved in or affected by Plan work. It is through such liaison that this agency is in position to guide the most advantageous scheduling and assignment of work.

The foregoing processes of review and co-ordination are essentially staff services to the Managing Director and the High Council. In none of the functions just described is actual authority exercised except in routine matters. The real purpose of these functions is to enable the intelligent exercise of authority at a higher level by placing before the responsible executive the facts which he requires for making a sound decision.

SUPPLYING COMPANY AND BUSINESS SERVICES

One of the best-founded criticisms that is commonly leveled against Government-operated or state-owned economic undertakings is that, for a variety of reasons, such operations are not managed with anything like the efficiency that characterizes most successful private enterprises. The general truth of this is borne out by so much evidence in so many countries that it is scarcely worth reviewing the facts here. Evidence is abundantly available that Iran is no exception to the general rule.

Nevertheless, it is inescapable that the government of Iran, through the Seven Year Plan and otherwise, must take a conspicuous part in organizing, financing and operating many new undertakings which are primarily commercial in character during the initial stages of the national development program. At the same time one of its present aims is to encourage and assist private investors and operators to establish their own enterprises, not only to utilize the maximum amount of private capital but also to develop the individual initiative and resourcefulness of the people of the country.

It is expected that many of the enterprises organized initially as Government-owned companies will be transferred, progressively in some cases, to private ownership when and as such companies become established as successful operations. This will release the public funds invested in such undertakings for new developments in other fields.

The proper organization of new Government companies, the reorganization of existing ones, assisting in the organization of private companies, providing management counsel of many kinds and in general supervising the critically important management and business affairs of all commercial activities which fall within the responsibility of the Seven Year Plan administration, present a category of specialized business management problems of high importance. One of the major functions of the Plan Organization is to provide specialized management counsel and other business services of the kinds which are essential to the success of ordinary commercial enterprises but not customarily available either in Government institutions or in newly-founded private business concerns.

The agency which we have provided for this purpose in our recommended organization is shown as the Department of Company and Business Services. To indicate our

present idea of the internal form which may be best suited to its functions we show four subdivisions under the Manager: Government Companies, Co-operatives, Private Enterprise, Distribution and Marketing. Appendix N-I shows the scope of the functions under each of these supervisory divisions.

Generally speaking, the Manager of Company and Business Services will be called in whenever a major problem of company organization or reorganization arises, and, with such foreign experts as may be needed to deal with special aspects of the problem, will guide the action. His functions will correspond almost exactly to those of similar expert business advisors in the United States. In some cases the situation will require only skilled diagnosis and correction of organizational or administrative weaknesses. In others it will be a matter of setting up a new company, with all the problems of legal formation, finance, organization and personnel. In the case of an operating company for which the Plan Organization is responsible, it will be the responsibility of this Manager to watch the operations, without direct interference, for assurance that its affairs are competently managed from the business point of view and to provide whatever assistance is necessary and requested. In a typical case a new or a small company may require occasional special services in establishing a personnel organization, setting up an accounting system, working out a price schedule, adjusting its budget, expanding its capitalization or securing expert technical services. The Department of Company and Business Services can give assistance in all such situations without it becoming necessary for each individual company to maintain corresponding specialists on its own staff.

Such services as have just been mentioned should be available to private concerns whose activities are consonant with Plan objectives, in some cases free and in others at actual cost, depending upon the nature of the service supplied.

To make clear the relationship between the Department of Company and Business Services and other agencies of the proposed organization a few illustrative examples will be given.

In order to market agricultural products it will be necessary to organize farmers' co-operatives. The only men in the Plan Organization (or in related Government agencies) who are close enough to the farmers themselves to understand their problems and to have their confidence are the farm advisors, who are the only ones also who have a technical knowledge of matters such as what crops can be raised, what quantities and qualities are attainable, and what seasonal rotation is best suited. Ordinarily, however, they will not know the circumstances of distant markets, domestic or export, or of competitive sources of supply, which determine the economics of surplus production. Nor are these technical specialists likely to be experienced in the field of business organization and management.

When the question of creating a co-operative arises, therefore, the co-operative supervisor and the distribution and marketing supervisor (from the Department of Company and Business Services) will collaborate with the agricultural supervisor concerned to set up a co-operative best suited to the conditions, and thereafter, without destroying the autonomy of its routine operations, will give it the same over-all supervision as a business concern that they give to any other Plan company.

In the case of a water development project it is the engineers (or later perhaps the management of a Government-owned water corporation) that will know best what physical measures should be taken to make the water from a particular source available for irrigation and municipal use, possibly in combination with a power generating program. To

set up the company or system of companies, however, which may be required to finance and operate such a scheme, the Manager of Company and Business Services must be called in. Such an undertaking must be self-liquidating, which means that it must be run as a business and not merely as a bulge on the national budget. At a certain point in its development some part of the project may properly become an activity appropriate for private capital participation or for transfer to a municipality. Quite apart from the engineering function of constructing the works, and even from finding the initial capital, are the continuing problems of administering the operation at a profit sufficient to service the investment. Over-all supervision by the Department of Company and Business Services is aimed at giving assurance of this.

In the case of private enterprise this department can be equally useful. While the mandate given to the Plan Organization does not include either a bureaucratic or a paternalistic supervision over private enterprise at large, it does charge the Plan to encourage and assist private investors in efforts which are compatible with Plan objectives. Prudent private investors are very likely to request such assistance. For example, a group of private investors may wish to explore the possibilities of manufacturing building materials. Their first step could well be to review the situation with the private enterprise supervisor and through him secure such relevant information as is available from other Plan agencies, including market analysis, housing, engineering and manufacturing. A business consultant would assist in outlining the steps to be taken to organize a company and to forecast expenditures and revenues as a basis for financing. If the venture appeared sound, additional equity capital might be attracted on the strength of the Plan experts' endorsement, or private loans arranged, or the Plan itself might extend credit. While actual administration of private enterprise would be quite independent of Plan supervision, specialists would be available to give many kinds of advisory service and to assist in securing experts from other sources when necessary.

In the example just given the Plan Organization might give valuable advice, based not only upon the skill of its experts but upon the broad knowledge of developing market demands for various products throughout the country or for export. A cement plant in one region, for example, might hold great promise of success while in another it might be premature or otherwise unjustified.

In this connection it should be made clear that while the Department of Company and Business Services undertakes, upon request, to anticipate and assist in providing for the needs which can be foreseen in order to make a company's operations successful, it does not guarantee against the consequences of incompetent operation or poor management. These are avoidable risks which can be pointed out by Plan advisors but which must ultimately be assumed by the investors themselves. The assumption of this responsibility, and the risks and promises of reward that go with it, is the very basis upon which private enterprise rests.

OTHER SPECIALIZED FUNCTIONS

The successful outcome of the Seven Year Plan will require that many functions of a specialized character be performed with an efficiency that cannot be hoped for unless the functions are directed by a thoroughly qualified man with experience in the particular work involved. Such a man can organize his own staff, define and direct its functional operations and train others to perform the work.

For many of these specialized functions it will be possible to find Iranians who have the necessary qualifications. In other cases it will be necessary to supplement the best qualified Iranians with experienced foreigners. In still other cases it will undoubtedly be advisable to employ skilled and experienced foreigners as managers or supervisors and to train Irianians under them for gradual advancement to the top position.

The function of purchasing, with the related functions of operating storehouses and agencies for the reclamation of used or surplus materials, is one which should be placed under a highly capable foreign expert from the beginning. The function of conducting geological explorations for oil is another one in the same category, as is also the function of organizing and directing the work of the General Engineering Department which is part of our recommended Plan Organization.

In this report we do not attempt to say precisely what specialists will be required by the various administrative and technical divisions of the Plan Organization, as this depends first of all upon the number and qualifications of available Iranian personnel. The determination of needs for foreign experts at all levels of the Organization will be one of the problems in which the consultants to the Managing Director and High Council can be of great assistance. After these needs have been determined, the selection of the foreign specialists will present another problem. Here again the consultants can be of service.

GOVERNMENT-OWNED COMPANIES

When it is essential that an operating project be managed efficiently over a considerable period of time without political interference or capricious changes in policy or personnel, a Government-owned joint stock company should be considered. It should be considered also when the undertaking is of a kind that may later warrant transfer in whole or in part to private ownership. There are so many obvious reasons for creating such a corporate entity to carry out many of the Plan's projects that discussion of them would not be warranted here except for the fact that another type of wholly Government-owned corporation is very likely to be urged by some. This is the type referred to loosely as the "bungah" ("institution", as distinguished from the "sherkat sehami", or joint stock company).

There are several distinctions which must be kept in mind when deciding which form of corporation to adopt in a particular case.

1. The joint stock company is formed under the Commercial Code of the country and is subject to orderly and well-established regulation under the general laws of the land. The bungah may be created by a special resolution of the Majless or simply by a decree of the Council of Ministers, and its legal status and conduct conform to no established standard.

2. The joint stock company is required by law to furnish its shareholders with a properly audited annual balance sheet and operating statement, which discloses the financial and other operations of the company. The bungah is under no such obligation and is free to merge its financial transactions with the budget of whatever Ministry is responsible for it. Its management is therefore relieved of the accountability which most reasonable persons would agree is essential to give assurance of proper and efficient management.

3. The shares of a joint stock company can be sold, in whole or in part, to private persons, thus enabling the Government to recover its initial capital and turn an enterprise over to private operators when this becomes advisable. The bungah must remain wholly Government-owned.

4. The joint stock company, according to the terms of its charter, vests certain responsibilities and powers in the hands of its board of directors. Thereafter, except by orderly process, the top management is not subject either change or arbitrary dictation from political sources. The management of a bungah may be changed at will by the responsible Ministry, which in effect places its direction entirely in the Ministry's hands.

In addition to the logical arguments suggested by the foregoing facts, observation of the actual conduct of typical bungahs, in comparison to that of joint stock companies in Iran, leads to our recommendation that the joint stock company be selected instead of the bungah in all cases where any of the four considerations mentioned above are important.

The bungah unquestionably has a useful place in the general administrative system of the Government. This comes from the fact that the creation of a bungah enables a Minister to isolate a particular undertaking from the routine inefficiency of typical political or civil service practice, and place it under a relatively independent control of his own. It is not recommended, however, when a joint stock company can be used equally well, if public responsibility for efficiency of management or for financial transactions is a major consideration.

When a joint stock company is to be organized for the purpose of executing a Plan project it is important to designate very carefully how the voting power of the Government, as a shareholder, is to be exercised. This as well as several other important conditions must be fixed in the company charter. The charter proposed for the Government-owned oil company, Appendix M-2 (Vol. IV), will illustrate several of these points.

SPECIAL RECOMMENDATIONS

While this entire section is intended to be used as a guide in establishing a Plan Organization for the adminstration of the Seven Year Plan, there are a few salient points which warrant special attention in the initial stages of organization.

The first step toward creating the organization discussed here should be the establishment of a salary scale embracing all the key positions in the proposed organization. Until this is done it will be impossible, for practical reasons, to determine the availability of many well-qualified men who are now bearing personal as well as professional or official responsibilities elsewhere. For this purpose it is not necessary that the precise duties of each position be known in any more detail than is shown in this report, extended as necessary to include positions not shown here. Salaries in the upper brackets of an organization are determined, generally speaking, by much broader considerations than in the case of hourly rates paid to skilled or semi-skilled labor. It is probable that not more than six salary groups will need to be fixed in the beginning, to include all men in the administrative organization below the Managing Director. Within each such salary group a range of salary should be provided for, to allow for variation in compensation according to degrees of competence, length of service and other factors pertaining to individual cases. The amount of the salary must be to some extent a matter of Plan Organization policy, but if men of

the proper qualifications are to be secured, their compensation must be sufficient to attract and hold them. With this in mind we recommend that the salary scale be made generally equal to that of the Anglo-Iranian Oil Company for its Iranian employees.

The second step toward creating the organization should be the selection, employment and tentative assignment of the best qualified men available as Managers of the 19 Departments described in Appendix N-1. It is especially emphasized that we do not recommend the appointment of men to fill the three positions described as Directors in this organization until a later stage in its development when such appointments can be made with greater certainty of judgment. The personal and professional qualities which are necessary for successful performance in the Plan Organization described here are quite different from those which may have determined the previous rank and title of men in other organizations. Each provisional Manager should at once begin to study the functions pertaining to his Department and to the relationship it bears to each other one and to the objectives of the Plan as a whole. The technical analysis of the functions of each Department will simply require careful study, but their interrelation may require accommodation of conflicting ideas. The necessary adjustments can be made much more simply, we believe, if done while the organization is still plastic. To proceed with the organization in this manner will not interfere with the prompt beginning of Plan work, as each Department must begin to perform its functions in order to develop its own procedures and train its personnel.

It is assumed that the Plan Organization will arrange for the services of consultants, who should advise each Manager in determining what foreign specialists will be required in the several divisions to assist in organizational work and to meet the early requirements of the Plan program. The earlier such specialists can be decided upon and secured (with the aid of the consultants in making the individual selections) the greater the assurance that the organization will be properly formed and directed.

Once the first steps have been taken to form the Plan Organization there is no single function more importantly needed than that of analyzing personnel requirements and availability. The Personnel Department should be afforded every facility for its effective operation. Both the problem of securing qualified men for the Plan organization itself, and the problem of putting into productive employment the many thousands of Government employees now carried on the payroll, will demand the fullest efforts of the Personnel Department.

The Seven Year Plan law including all notes and amendments is not a satisfactory source of reference concerning a number of important aspects of the Plan. Our own comments must, of course, be based upon the English translation which was furnished for our use, but it seems clear that the original text itself contains the faults to which we refer here. From the standpoint of administration the law is unsatisfactory, both because it fails to make its intentions clear in several important particulars and because in certain explicit provisions it makes effective execution practically impossible. We believe that the general intent of the law is clear enough, and if the details alluded to can be interpreted somewhat loosely until the High Council, Managing Director and Board of Control now appointed have an opportunity to restudy its language in the light of recent developments and propose certain modifications, its original intent will be preserved and the law as revised will serve as a valuable guide as well as a source of authority. We recommend that no such revision be proposed for the action of the Majless until our report has been carefully studied and the organizational, financial and technical problems which face the Plan

Organization have been studied carefully. This should provide a basis for revisions which will accomplish the necessary purpose. Meanwhile it will be necessary for the Plan Organization agencies created by the law to adopt a working agreement concerning the division of responsibilities and authority among them which permits a practical and effective Plan Organization to be formed.

During our study of this organizational problem we have been met many times with the hesitant opinion that what works well in some of the western countries may not work at all well in Iran. We have repeatedly been told that Iranian customs and temperament will not permit certain types of administrative procedure which we believe are essential to the success of the Plan. We have taken the position that, if Iran is resolute in its determination to achieve the aims of the Seven Year Plan, it must adopt methods which have been tried and proved elsewhere. We are convinced that, given necessary guidance and training, Iranians can do what anyone else can do, and we have accepted no counsels of despair. In line with this reasoning we recommend that wherever the basic administrative procedure which we have outlined here appears to be unsuited to individual temperaments or current practices, the first effort toward adjustment be to change the temperament or current practice, and not the recommended organization. Changes in principle which could be made by their advocates to appear inconsequential might easily deflect the course of the Plan toward the practices which have inhibited social and economic advancement in Iran for many generations.

APPENDIX N-1

TABLE OF ORGANIZATION

The general functions of each Managing Department and an indication of the supervisory subdivisions which might be required for their execution are given in the following organization table.

HIGH COUNCIL

"The High Council shall approve plans, projects and budgets within the limits of the operational program approved by the Program Commission of the Majless." (Article IX)

BOARD OF CONTROL

The Board of Control reports direct to the Council of Ministers and is charged to investigate matters referred to it by the Council of Ministers. (Article IX)

MANAGING DIRECTOR

The Managing Director is the chief executive of all dependent agencies of the Plan Organization and is responsible for the execution of all functions assigned to them. (Article IX)

STAFF ASSISTANTS

Staff Assistants perform for each Director, and member of the High Council or Board of Control, as necessary, such special or confidential services as pertain closely to those officials' own responsibilities and which cannot properly be delegated to any subdivision in the line organization. Such duties might include studies of the Organization itself, executive personnel records, political or publicity matters or confidential matters of any kind. Staff Assistants have no executive authority outside their own offices. Their function is to give personal and immediate assistance to the officials to whom they are attached.

CONSULTANTS

Consultants provide expert and experienced guidance, as necessary, to aid in the successful administration and execution of the Seven Year Plan. Consultants are without executive authority over any part of the Plan Organization. Their function is investigative and advisory only.

DIRECTOR OF ADMINISTRATION AND FINANCE

MANAGER OF ADMINISTRATION

Office Supervisor: Provides for and supervises all office services for Plan Organization, including office space and equipment and clerical personnel.

Publications Supervisor: Prepares for approval, and issues, reports, publications and regulations.

MANAGER OF FINANCE

Accounting Supervisor: Directs all accounting and internal audits pertaining to Plan funds. Maintains all Plan property records. Establishes and supervises effective cost accounting systems.

Budget Supervisor: Maintains Plan budget, with forecasted and actual expenditures and revenues.

Banking Supervisor: Makes all cash disbursements of Plan funds. Supervises all banking and credit operations. Directs all investments of Plan funds. Secures funds for Plan operations.

MANAGER OF PERSONNEL

Records Supervisor: Secures information for and maintains all records necessary for administration of Plan personnel.

Employment Supervisor: Supervises employment and transfers of personnel engaged in Plan work. Maintains schedules of forecasted and actual demand for labor. Supervises personnel classification and wage scales, and promotion and severance procedures.

Training Supervisor: Supervises (from personnel viewpoint) all training programs and educational work involved in Plan operations.

Welfare Supervisor: Supervises all matters pertaining to welfare of Plan personnel, including working hours and conditions, health, employees' benefits, safety, recreation, etc.

MANAGER OF LEGAL AFFAIRS

Directs all legal work in connection with Plan activities, including new or revised legislation, review of all contracts, claims or other legal actions, etc.

MANAGER OF ECONOMIC AND STATISTICAL SERVICES

Economics Supervisor: Directs studies of all economic conditions which have important effect upon Plan objectives, such as total national wealth and income; balance of payments; cost of living; monetary, fiscal and banking systems; tax systems; capital formation; effect upon Iran of economic conditions in other countries; special problems arising out of Plan activities, etc.

Statistics Supervisor: Directs compilation and interpretation of all trade, production, commercial, social, agricultural, census, meteorological and other statistics required for the effective administration of national, social or economic affairs.

MANAGER OF REVIEW AND CO-ORDINATION

Project Review Supervisor: Receives all proposals for the expenditure of Plan funds from whatever sources they originate and subjects them to uniform analysis for the purpose of determining their justification and relative priority. Recommends approval, disapproval or modification.

Scheduling Supervisor: Maintains project and master schedules showing forecasted and actual stages of execution with demands for all critical factors, including rials and foreign exchange, special personnel and equipment, labor, transport requirements, locally-produced materials, etc. Informs agencies concerned as to demands to be made upon them for services.

Liaison Supervisor: Maintains contact with all agencies involved in Plan work, including Government agencies, to promote collaboration, co-ordination, and efficiency, and to avoid conflicts, misunderstanding, confusion or delay.

MANAGER OF COMPANY AND BUSINESS SERVICES

Government Company Supervisor: Supervises organization (or reorganization) and operation of Government companies involved in Plan activities. Secures necessary technical or management consulting services for Government companies.

Co-operative Supervisor: Supervises organization and operation of co-operatives. Provides or arranges for technical or other specialized advisory services.

Private Enterprise Supervisor: Encourages, guides and assists private enterprises within scope of Plan. Provides or arranges for expert technical and management services. Analyzes new opportunities for private undertakings. Assists in financing private enterprise through Plan or other sources of credit or investment.

Distribution and Marketing Supervisor: Studies wholesale and retail distribution and marketing system and promotes more advantageous practices. Studies pricing system and need of controls. Recommends and assists in establishment of better quality-control and grading of products. Studies export outlets and assists in establishing effective foreign representation for disposal of exportable surpluses. Recommends safeguards against restrictive practices.

DIRECTOR OF TECHNICAL SERVICES

MANAGER OF PURCHASING, STORES AND SALVAGE

Purchasing Supervisor: Prepares standard specifications for commonly-used materials and equipment. Performs or supervises all local and foreign buying for Plan projects. Arranges for and directs negotiations with foreign purchasing agents.

Traffic Supervisor: Directs or guides arrangements for delivery of purchased materials and equipment. Follows up all shipments.

Inspection Supervisor: Directs all necessary inspection, both domestic and foreign, to insure satisfactory quality and conformity with specifications.

Storehouse Supervisor: Directs all material storehouse operations, including care and disbursement of materials, maintaining standardized stocks of frequently-used material, care of special stocks ordered for particular services, maintaining current inventory of stocks on hand, etc.

Salvage Supervisor: Directs all reclamation of used or damaged material and equipment for re-use or sale.

MANAGER OF GENERAL ENGINEERING

Designs and Studies Supervisor: Directs engineering studies and designs for all agencies upon request.

Drafting and Mapping Supervisor: Directs drafting, mapping, surveying, blueprinting, photostating and photography, for all agencies upon request.

Estimating Supervisor: Maintains cost records of all recurring types of work and prepares costs estimates, or furnishes necessary data to others upon request.

Supervisor of Contracts: Supervises the preparation and negotiation of contracts for all Plan agencies, selects contractors and approves all contracts before execution. Assists private persons or companies in a similar manner by arrangement.

Supervisor of Construction: Directs the performance of Plan works assigned to General Engineering Department for execution. Directs the field supervision of Plan contract work.

MANAGER OF MANUFACTURING

Supervisor of Factories: Directs the work of a staff of operating and maintenance specialists who inspect all factories involved in the Plan, makes recommendations concerning improvements and, as directed or requested, assists in making corrections or improvements.

Supervisor of New Industries: Directs investigations aimed at disclosing and appraising new industrial opportunities in all fields, including extensions or alterations to existing factories, and makes recommendations for their development. Investigates and appraises raw material supplies.

Supervisor of Industrial Laboratory: Directs work of laboratory to perform tests of products, materials and equipment. Establishes standards of quality. Conducts research as required.

MANAGER OF MINERAL RESOURCES

Supervisor of Petroleum: Directs, for the Plan, the organization and operation of the Government-owned oil company which is required by the Seven Year Plan law.

Supervisor of Mines: Directs the exploration for and development of mineral deposits other than oil. Assists private operators by arrangement.

Supervisor of Geological Services: Directs the compilation of general geological, mineralogical and ground water maps. Arranges for special geological studies as requested.

MANAGER OF ELECTRIC POWER

Supervisor of Generation and Distribution: Directs studies of potential hydro-electric sources and of prospective thermal and diesel generating plants. Prepares and directs execution of plans for new generating capacity and for transmission and distribution systems. Supervises technical operation of Plan power systems and assists others by arrangement. Assists, or by arrangement directs, installation of municipal power systems.

Supervisor of Electric Energy Utilization: Directs studies of present and potential electric demand, cost of energy to consumers, opportunities for new and advantageous uses, availability of equipment and appliances. Assists private and municipal power companies to improve and extend their service.

MANAGER OF WATER DEVELOPMENT

Supervisor of Surface Water Supply: Directs studies to determine potential supplies of surface water and the best means of making them available for use. Prepares and directs execution of approved projects for water storage and main distribution systems.

Supervisor of Ground Water Supply: Direct studies to discover underground water supplies and supervises location, drilling, equipping and operation of wells.

Supervisor of Domestic Water Supply: Supervises Plan activities aimed at improvement of municipal or other domestic water systems.

MANAGER OF TRANSPORTATION

Supervisor of Railroads: Supervises Plan activities aimed at improvement of railroad system, including extensions, new equipment, maintenance and operation. Directs studies of freight and passenger tariffs.

Supervisor of Roads: Supervises Plan activities concerned with location, type, construction and maintenance of roads.

Supervisor of Motor Transport: Investigates and recommends concerning the best type of motor transport equipment for various needs in the country; directs selection of equipment for Plan operations and the training of operators and maintenance men. Organizes and supervises facilities for inspection and maintenance of all Plan motor transport equipment. Investigates and recommends concerning the organization of Government or private motor transport freight and passenger services.

Supervisor of Ports: Prepares plans and supervises approved projects for development or improvement of port and harbor facilities, including marine and dock facilities, warehouses and land transport terminals, their operation and maintenance.

Supervisor of Air Transport: Supervises Plan activities relating to civil aviation.

MANAGER OF TELECOMMUNICATIONS

Supervisor of Telephones and Telegraphs: Prepares plans and supervises approved projects for improvement and extension of telephone and telegraph services, including technical guidance to private companies as arranged. Proposes and supervises measures for "public utility" type of regulation for such services.

Supervisor of Radio Communication and Broadcasting: Supervises Plan activities relating to domestic and international radio communication and the development and regulation of broadcasting systems.

DIRECTOR OF AGRICULTURE AND SOCIAL SERVICES

MANAGER OF AGRICULTURAL SERVICES

Supervisor of Plant Science: Directs Plan activities in connection with research and extension (field) service in agronomy; horticulture, plant breeding, forestry, plant pathology and entomology.

Supervisor of Animal Science: Directs Plan activities in connection with research and extension (field) service in livestock husbandry, dairy husbandry, poultry husbandry and animal pathology.

Supervisor of Agricultural Engineering: Directs Plan activities in connection with research and extension (field) service in farm machinery, farm structures, irrigation practice and drainage.

Supervisor of Agricultural Economics: Directs Plan activities in connection with research and extension (field) service in farm management, marketing, land economics, agricultural prices and statistics, rural sociology and rural organizations.

MANAGER OF PUBLIC HEALTH SERVICES

Supervisor of Disease Control: Directs all measures within the Plan program aimed at the prevention or control of disease and the improvement of public health through the application of medical or public health science.

Supervisor of Public Sanitation: Directs all measures within the Plan program aimed at the improvement of public health through the application of sanitary engineering practices.

MANAGER OF EDUCATION AND TRAINING

Supervisor of Research and Planning: Supervises interpretation of educational policy under Plan objectives and development of plans for application, appraisal of past and continuing programs, development of practical educational services, fundamental educational research, and dissemination of information on new programs.

Supervisor of Industrial Training: Co-ordinates educational and training programs serving Plan objectives in the fields of industry, engineering, mechanical trades and clerical work, and directs the organization and conduct of such programs, including collaboration with related industrial organizations.

Supervisor of Rural Education: Co-ordinates educational and training programs serving Plan objectives in the fields of fundamental education, agriculture, and public health in rural areas and among tribes and directs the organization and conduct of such programs, including collaboration with the public school system.

Supervisor of Special Education: Co-ordinates educational and training programs serving Plan objectives in the fields of adult, women's and non-school education and in the development of extension courses and mass education media, and directs the organization and conduct of such programs, including collaboration with the public school system.

Supervisor of Teacher Training: Co-ordinates educational and training programs serving Plan objectives in all teacher training, directing the organization and conduct of such programs, and supervises selection of all candidates for special overseas training, making arrangements for the programs and assisting in subsequent placement. Collaboration will be required with all interested agencies.

MANAGER OF SOCIAL WELFARE SERVICES

Conducts investigations, prepares plans and supervises approved projects aimed at improving the general social welfare of the people in fields embraced by the Plan and not included in other divisions of the program. Examples are: care of the aged, poor or infirm; improvement of penal institutions; collaboration with religious or philanthropic institutions; public recreation facilities; organization and direction of effective emergency relief services, etc.

STATISTICAL ORGANIZATION

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STATISTICAL ORGANIZATION

INTRODUCTION

Accurate statistical data are essential for the planning and execution of an economic development program. It is impossible to plan in any detail in the important categories of water resources and agriculture without information on climate and hydrology; population data are necessary in almost every segment of human endeavor; and figures on health, labor supply, crops, utilization of land, industrial production, power, transportation facilities, prices and finance all play their part in planning. The statistics existing at present in most of these categories in Iran are either fragmentary, or while too often apparently complete are in fact inaccurate. This somewhat sweeping condemnation is made not only by the staff of the Plan Organization and other personnel working in conjunction with it, but is made by almost every Government official in the country whose work brings him into contact with statistical data.

It is therefore essential that the Seven Year Plan include certain statistical projects of a special or extremely expensive nature which cannot very well be undertaken by the Government outside its auspices, and in addition contain within itself a smaller plan for the complete reorganization of statistics throughout the whole Governmental machine. This smaller plan can be implemented gradually, as development proceeds. In this plan within a plan for statistics there must be two aims: (1) the creation of a statistical organization which will function efficiently in future years; and (2) the early extraction of statistics in certain segments of the economy necessary to feed the Plan Organization itself. It is vital that the gathering of statistics and the build-up of a statistical system should be commenced some years before the actual planning.

It is for this reason that the examination of the statistical organization of the Government commenced some time in advance of the work of the main OCI group and that it was made in the greatest detail possible. During five months, therefore, at the commencement of 1327 (1948) and three subsequent periods, an examination was made of all Government offices which either have or should have statistics, and certain interim reports have been presented. This examination covered the Bureau of Research and Statistics, previously forming part of the Ministry of Finance and now attached to the Plan Authority; the Census, Civil Registration and other statistical offices of the Ministry of the Interior; and the Ministries of Health, Labor, Agriculture, National Economy, Finance, Education, Justice, and Roads and Communications. A special investigation was made of the Customs Statistical Bureau and of the principal sources of its figures at the Customs post at Khorram-shahr. Outside the Ministries proper an examination was made on request of the production and other statistics of the Industrial and Mining Bank, the Tobacco Monopoly and the Iranian State Railways. Much work was devoted to the statistics of the Bank Melli, and in 1327 (1948) advice was given to a committee set up by that bank for the preparation of the balance of payments.

Since it was clear that the figures maintained by Ministries did not always represent with exactitude the situation in the provinces two ostan headquarters (Isfahan and Mazandaran) were visited as well as a number of other Government offices outside Tehran.

In the course of the above visits statistical sections, their methods, forms and the quality of their existing data were examined in the greatest detail. Discussions were held with members of the Provisional Planning Board, several Ministers, the great majority of senior Government officials and practically all the statistical officials in the Government, in addition to a number of interested outside people such as representatives of the International Bank for Reconstruction and Development. In compiling the present report, which represents the Seven Year Plan for statistical reorganization and embodies both detailed and general recommendations arising from this study, careful note has been taken of the statistical methods in use in other countries and of the publications not only of Iran but of other Middle East countries, the United Kingdom and the United States. The aim has been to insure that any scheme designed for Iran is in accordance with the best international practice, and therefore the recommendations of the United Nations Statistical Commission have been carefully studied.

The statistical portion of this report, which embodies the results of these studies, is divided into four parts, of which this Part is the introduction. Under the next main heading, General Considerations, is a discussion of the general principles of Governmental statistics, proceeding to a consideration of the main faults of Iranian statistics, followed by a broad outline of the proposed organization whose function it will be to build up data devoid of these faults. The statistics of an entire Government form a large and complicated field, and under General Considerations, therefore, there has been presented a co-ordinated and logical pattern in which all types of Government statistics are aranged in the most satisfactory order. This pattern is applicable not only to the present report but to plans for future work in the country and has been specially devised since few rationalizations of this nature exist ready-made, though a number of Government abstracts and certain UNO pamphlets have naturally by force of circumstances been laid out in some sort of logical fashion.

The main body of this section of the report is headed Detailed Discussion and Recommendations, in which all types of statistics either existing in the Government or which should exist therein are discussed separately. In accordance with the pattern as laid out in General Considerations, the body of this section has been arranged under the following heads: physical statistics, demographic statistics, social statistics, statistics of production, and financial statistics. The term "production" has been used in the very widest sense, and this chapter is sub-divided into four parts dealing with natural resources, industrial production and distribution, foreign trade, and transportation and communications. Each of these broad heads is again divided into a number of sections dealing with a specific subject. An endeavor has been made to consider within each one of these sections the general problem and the aims of statistics in this field; the present situation in Iran and the faults or merits of the existing statistics are then discussed; and finally recommendations are made, which are as far as possible specific and concrete and accompanied by a budget estimate. These recommendations have practical application and should be carried out under the auspices of the Plan Organization. The general or pious aspiration type of statement has been in the main avoided.

Hence the recommendations are as a rule specific, and vary from major items of the widest importance and significance to very minor points on the detailed lay-out of tables with specimen forms. Statistics are a science of detail and it is therefore neces-

sary, if this report is to be of any value, to be more detailed than would usually be given in such a report to the Plan Organization.

Under the last text heading of this section of the report a pattern for a Central Statistical Bureau is put forward, the methods of implementation are discussed, and the whole report tied together by a summary of recommendations. With these recommendations is given a list of Ministries and departments which are directly affected by the individual surveys discussed in the body of this section of the report.

However much the statistics of the Government may be improved by the action of Ministries with careful attention to the detailed recommendations following, the proper co-ordination between departments, the technical control of statistical methods, the handling of specialized work and the provision of figures to the Plan Organization can be economically carried out only by a strong centralized statistical bureau, which is empowered with the technical control of statistical sections in the various Ministries. It should be the function of the Seven Year Plan Organization, of which this Central Statistical Bureau will form a part, to improve and reorganize the statistics throughout the whole of the Government. Therefore there have been included in this report many recommendations which will not form part of the specific Plan projects and the cost of which will not be borne by the Plan but which the Plan will have power to co-ordinate.

GENERAL CONSIDERATIONS

Before proceeding to a consideration in detail of all the types of Government statistics which exist or should exist in Iran, it is necessary to discuss briefly some general principles in order to understand fully the background against which later detailed discussion rests. The discussion immediately following, therefore, covers very broadly some of the general principles of statistical work, endeavors to arrange into a logical pattern all kinds of statistics which a Government may have, and discusses in general the faults of Iranian statistics and the remedial measures that should be taken.

It has seemed best to divide this discussion into four parts:

1. General principles.
2. Logical lay-out.
3. General criticisms of Iranian Government statistics and outline for remedial organization.
4. Considerations on principles and method in handling Governmental statistics.

GENERAL PRINCIPLES

There is nothing in fact obscure or strange about the science of statistics. Yet there is a tendency in many quarters to believe that the science is a particularly difficult one, in which mathematical symbols of impressive appearance and unknown significance

are juggled by the learned statistician in bewildering succession. Statistical analysis, it is thought, must be a closed book to the average man and therefore perhaps of little practical application. Another point of view which is often taken is that of the user who, whether or not he understands statistical techniques, is completely confident that the statistician can produce something concrete out of thin air. It should be understood from the outset that the statistician is neither a person who performs quite strange and purposeless rites unrelated to the work of the Government, nor a magician who can produce the data necessary for that work without the co-operation of his fellow officials. The Governmental statistician cannot be either a theoretician or a conjurer.

Statistics are in truth just facts, but facts expressed in a quantitative numerical way. They are facts in the form of numbers resulting from the counting of a great many individual units, which can be placed in relation one to another and so compared. The science of statistics has in fact two faces—the methods of collecting, summarizing, comparing and analyzing these numerical facts; and the advanced mathematical techniques which may or may not be used in this analysis. It is the former aspect of statistical work with which we are most concerned in the present report. Until the basic data collected by the Government of Iran are accurate and complete, it is unlikely that there will be much scope for the application of the higher mathematical techniques, except perhaps in cases where the very inadequacy of the data forces us to use some special mathematical method (for example, the techniques applied to sampling) in order to evaluate what is probably a complete whole.

The officials of a Government, therefore, must not consider that the science of statistics is something so remote from them that its application can be left to small specialized sections or be disregarded altogether. Statistical work, in so far as this report is concerned, is really a matter of administrative organization of the numerical data obtainable on all aspects of the country's life. It is the science, from the Government's point of view, of the organization, summary, analysis and presentation of numerical facts in the clearest and most useful way possible. A Government is run on facts and therefore cannot make its decisions and put them into effect without the aid of statistics and statisticians. It is of little value to know the name of every tree in a particular forest; but if we can add up the totals of each kind of tree, their approximate size, the quantity of timber in them and facts on the possible utilization of this timber, together with some data on means of transport to and from the forest, the rainfall and possible soil erosion, we have obtained a valuable statistical analysis on which the Minister concerned can base his policy. Unless we analyze the individual units of information, we literally cannot see the forest for the trees. The absolute vital necessity, therefore, for the collection of good statistics and for their analysis cannot be overemphasized at the very beginning of the present report; and the advent of the Seven Year Plan only reinforces this point. Again and again it must be stressed that a Government will not run properly without good statistics and that all the planning is doomed to failure unless it is based on numerical facts, which must be extracted at an early stage in the Plan.

It is vital, therefore, to have accurate and complete figures and for their handling a specialized organization is essential. In 1943 (1322) a Middle East Statistical Conference was held in Cairo under the auspices of the Middle East Supply Centre. At this conference it was emphasized that the Governments of the Middle East were badly handicapped in their wartime control and planning by the lack of accurate statistics, and it was

suggested that each Government should assume by law drastic compulsory powers to obtain the necessary information. This is just as important in peacetime and, in view of the great economic developments foreshadowed in Iran, perhaps even more important. For, making peace is more important and more constructive than making war; and the Seven Year Plan, if it is anything, is the strategy for war of another kind, a war upon poverty, ignorance and disease, a war to give to every man in this country a standard of living which its natural resources justify. In such a war the organization of the Plan is, in a sense, together with the Council of Ministers, the General Staff; and statistics are the maps from which they plan their campaigns. It is therefore essential that from the very beginning of the Plan we should build up a statistical organization to provide the necessary figures and to improve the existing detail.

It is necessary in using Government statistics to distinguish between the exact comparison of present "Assets and Liabilities", that is, statements of the existing situation; and the determination of forward trends and of differences in efficiency and quality. For the first we require exact counts, well organized by a good administrative machine, so that we know, for example, how many people in the country are literate or illiterate, how many workers there are of a particular trade, or how much the production of a textile industry may be. This work postulates a series of organized statistical sections. The second aspect may involve more mathematical techniques and postulates the existence of a group of trained statisticians somewhere near the center of the control of the country's economy.

LOGICAL LAY-OUT

We have stated above that the science of statistics as applied to matters of Government is comparatively simple and of great practical utility, being concerned chiefly with the administrative organization and evaluation of numerical facts. We have also said that we may either count facts directly or attempt the determination of trends and the making of comparisons, and that for both these uses a proper statistical organization is essential. How many different subjects, however, can we group under the heading of Government statistics? To how many different aspects of a Government's work does the science of statistics apply? What specifically are Government statistics? After careful consideration a pattern has been evolved which, it is thought, lists all the types of Government statistics and places them in a logical order. This pattern was first devised to meet the needs of the adjacent country of Iraq; but it has been carefully reconsidered and revised following experience of the examination of Iranian statistics.

This pattern has been worked out on a rational basis by considering first of all what are the main heads on which we require information in regard to a country. These heads can perhaps be most easily arrived at by considering what facts we would require for a complete description of an individual man. We should want, it is thought, to know in what sort of a place he lives, that is, facts about his house. We should require physical facts about himself, that is, his appearance, family, sex, age, health, and so on. Then we should want to know how the man lives; that is, what are his private interests, his amusements, his education, his home life, and so on. Fourthly, we would require to know facts about his occupation, his economic activities, what he does for a living, the materials, if any, that he uses in his business, what he produces, what he transports, and the like. Finally, we would require to know something about his financial status, about the money which he has in his pocket, his savings and his income.

Thus it would seem that if we take a nation to be the aggregate of the individuals composing it, we are required to know the following about the country:

1. A description of the country—the physical facts about it.
2. A description of the people, that is, the physical facts about them.
3. Facts about the people's way of life, that is, a description of the people as a society.
4. A description of the people's work, that is, what they grow, make, sell or carry.
5. The country's finances.

It may be argued that there are other heads; but it will be found that they all can be logically brought in within these five. If we now turn the above statements into the language of statistics, we can broadly and logically divide the Governmental statistics of a country into the following heads:

1. Physical.
2. Demographic, which best includes Public Health.
3. Social—
   a. Man in all human relationships—General—Social conditions.
   b. Man in his working relationships—Specific—Labor conditions.
   c. Man in his extra-territorial relationships—External—Defense (and Foreign Affairs).
4. Production—
   a. Natural Resources
   b. Industry and Commerce
   c. Trade
   d. Transport and Communications.
5. Financial.

From the above scheme we can work out in detail the following logical organization or Master Pattern on the organization of Governmental statistics:

1. Physical
   a. Geographical facts—Cartographic survey.
   b. Climatic facts—Meteorological data.
2. Demographic
   a. The population census.
   b. Vital statistics—Mortality and movement of population.
   c. Public Health—Morbidity.

3. Social

a. General:

i. Social services and internal administration.

This in Iran may readily be divided into three sub-parts:

Administrative statistics of the Ministry of the Interior and municipal organization.

Statistics of housing.

Social insurance statistics.

ii. Education.

iii. Justice and Crime.

b. Labor.

c. Defense and foreign affairs.

Defense and Labor are best grouped under Social since they concern man's relationship to man. Public utilities, which are sometimes regarded from their social aspect, are probably best dealt with in the present scheme in conjunction with production.

4. Production

a. Natural Resources

(which could if necessary be sub-divided into Land and Water; Animal and Vegetable; and Mineral).

i. Land settlement and land utilization.

ii. Water resources.

iii. Agriculture.

iv. Forests.

v. Fisheries.

vi. Oil and Minerals.

b. Industry and Commerce

(which is the secondary transformation of the natural resources).

i. Electrical power.

ii. Industrial production.

This in Iran can readily be divided into:

Statistics of the private factories of the country.

Statistics of the Government factories under the Industrial and Mining Bank.

Statistics of the Government Monopolies not controlled by the Industrial and Mining Bank.

iii. Commerce and distribution.

c. Foreign Trade
(that is, the exchange of the products of industry or natural resources for those of other countries).

d. Transportation and Communications
(that is, the physical means of moving or exchanging commodities).

i. Railroads.

ii. Highways and Road Transport.

iii. Shipping and Ports.

iv. Aviation.

v. Posts and Telecommunications.

5. Financial

i. National Income.

ii. The Balance of Payments.

iii. Currency.

iv. Exchange.

v. Banking.

vi. Government revenues and taxation.

This is readily divisible in Iran into:
Income and other direct taxation.
Indirect taxation.
The Government accounting system.

vii. Wholesale prices and index thereof.

viii. Retail prices and the Cost-of-Living Index.

ix. Statistics on the registration of companies.

x. Statistics of the civil service and pensions.

The above is not, of course, a rigid scheme, but it appears sufficiently comprehensive and while worked out independently it does not differ in any serious degree from the comparatively small number of logical schemes already in existence; for example, the lay-out of the British Government Abstract of Statistics, the United States Government Abstract or the International Statistical Institute library classification scheme. The system has been used for the lay-out of the body of this section of the report, and it is recommended that in general Iranian Government statistical publications should be on the same lines. It will be found that the scheme for the Central Statistical Bureau is also in the main based on the above system.

GENERAL CRITICISMS AND REMEDIAL OUTLINE

If we bear in mind the vital necessity of statistical data, as outlined under General Principles, and consider the existing data under all the heads set out in Logical Lay-out, it will be found that Iranian Government statistics at the moment suffer from a number of faults. Of these, the principal in general terms are:

1. The statistical machine seems to be suffering from lack of maintenance, that is, in many Ministries statistical sections exist which appear at one time to have been devised on sound lines and to have employed sound methods but which now have become stereotyped and standardized. It would seem, in fact, that the statistical machinery of the Iranian Government was better ten years ago than it is now, and that the events of war, the reduction in the impetus of development of the national economy, and the lowering of the real wages of Government officials have combined to produce a lack of purpose in the production of statistics, a failure to seize new systems and reorganize old ones, and a lack of interest among statistical employees.

2. Certain essential figures of major importance are wholly or partly lacking; for example, population census, climatic and forestry data, production and accounting statistics of the Government factories. The last is a particularly unfortunate deficiency and a culpable one, since it could be so easily remedied.

3. Despite these gaps, the Government as a whole does not lack figures. The major deficiency is an excess of duplicated inaccurate statistics; for example, there are several sources for agricultural figures, none very trustworthy.

4. The approach to statistical work is, as may be gathered from 3 above, often unrealistic. Graphs, for example, are in general designed in an elaborate but incomprehensible fashion; for example, the use of circular banded bar charts or of banded pie charts for time series. Pictures of trains coming round a curve intended to illustrate total rail haulage may be graphic and picturesque, but they can scarcely be considered to give an accurate basis for comparison. Similarly, figures are often produced which are of little value in the making of any Government decision. The question should always be asked before extracting statistics, "What are these for?"

5. There is a tendency for Ministries to have figures which show only the working of the administrative machine and not the condition of that particular aspect of the national life which it is their function to assist or control. Thus it is apparently thought sufficient to collect figures of the administrative working of the Courts of Justice, rather than to analyze the state of crime in the country.

6. Nation-wide complete counts are often attempted (usually without success) in matters in which sample studies or concentration on accuracy and completeness in a limited field would be more profitable. Thus an attempt is made to take a complete count of agricultural production rather than to base these statistics on sample studies.

7. There is no organization for making spot checks of the figures of any department and no statistical inspection team.

8. A strong central statistical organization is lacking. Hence there is no really powerful co-ordinating force which can insure that the statistical departments of the various ministries use the most up-to-date techniques, do not overlap each other, produce the figures required either for their own Ministry or for the Plan Organization, and employ comparable bases and definitions.

In view of these faults it is vitally important that a statistical scheme form part of the Seven Year Plan. This Seven Year Plan for statistics should have two aims:

1. The creation of an organization which will function efficiently in future years.

2. The early extraction of statistics in certain fields necessary to feed the Plan Organization itself.

The first priorities on statistical planning must therefore be: laying the foundations of an organization; commencement of collection of meteorological data; derivation of statistics of industrial production and in particular of Government factories; improvement of statistics of the labor force; the build-up of the Census organization; and the improvement of those statistics already available on which only a small amount of action is required; for example, foreign trade. A second but high priority should be accorded to the reorganization of agricultural statistics and in particular the estimates of production; public health statistics; revision of economic indicators—for example, Cost-of-Living Index; the taking of the Census; and the development of the central statistical organization. In the third priority falls the build-up of the remainder of the statistical organization throughout the Government and the utilization of this machine for the production of more accurate long-term statistics.

The above program can be achieved only by careful attention to detailed improvement of each type of statistics within each Ministry, as well as the building up of a complete statistical organization. The recommendations for the former will be found later under Detailed Discussion; and subsequently a scheme for a Central Statistical Bureau forming part of the Plan Organization. This is followed by an outline showing the relations of this Bureau with other statistical sections of the Government.

In brief, it is recommended that the Central Statistical Bureau should have four principal functions:

1. The collection of data from all Ministries which have been already analyzed by the departmental statistical sections and for which the Central Statistical Bureau will act as a co-ordination and publication center and as an "exchange mart" for the passing of statistics from one Ministry to another.

2. The application to such data of the higher mathematical techniques for the purpose of determining trends and making comparisons of efficiency and quality. This work will require highly specialized personnel and, in view of the limited supply, these should be concentrated.

3. The handling of certain basic statistics requiring the use of specialized machinery or techniques and, in particular, of the installation of punched card machines which is recommended in the Central Statistical Bureau.

This machine pool will take in the basic data after it has been checked for subject matter by the appropriate Ministry, will tabulate and extract, and will return the finished product to the Ministries and to any other user.

4. The technical control of statistical methods throughout the Government.

The Central Statistical Bureau will thus be the co-ordinating center of the whole of the statistical organization and in technical control thereof; it will also be the principal publishing agency, the center of the application of specialized techniques and the provider of all statistics required by the Plan Organization. The Bureau will have to be set up and given its powers under a law of statistics.

Within the Ministries it is recommended that there shall be major statistical sections in the Ministry of the Interior (handling census, civil registration and statistics on municipalities and local administration); in the Ministry of Agriculture (handling agricultural statistics); in the Ministry of Labor (handling labor statistics); in the Ministry of National Economy (handling production, mineral, electric power, commerce and distribution statistics); in the proposed Water Authority (handling meteorological and hydrological statistics); in the Customs Department of the Ministry of Finance; and in the Bank Melli (handling financial and economic statistics). There will also be smaller statistical sections handling their own specialized subject in the Ministries of Health, Education and Justice, the Central Housing Authority and the Industrial and Mining Bank. Certain specialized departments or agencies will also handle their own statistics, namely: the Insurance Company of Iran; the Land Settlement Department of the Ministry of Justice; the proposed Government Forestry Corporation; the Fisheries Department of the Ministry of Agriculture; the Tobacco Monopoly; the Iranian State Railways; the Roads Department; the Civil Aviation Department; the Ministry of Posts, Telegraphs and Telephones; and certain departments in the Ministry of Finance concerned with taxation, revenue and civil service. All the above sections will be linked to the Central Statistical Bureau in the manner described under its functions above.

PRINCIPLES AND METHODS DESIRED

In improving the statistics of the Government of Iran, both in detail within the Ministries and in general by the build-up of the whole organization, it is essential that the following points be observed in practice and principle:

1. The quality of the present statistical staff is, speaking broadly, not satisfactory. Persons employed by statistical sections should be regarded as technical staff and treated as such, both in regard to their salary, their recruitment and the demands which are made on them. Only experienced and interested personnel should be recruited, who must realize the importance of their work and have some element of the missionary spirit. Once the present statistical staff have been either retained or rejected and fresh blood recruited, the personnel should as far as possible remain the same. As is said in a report produced by one of the officials of the Bank Melli (Mr. Aghili), "In the opinion of all statisticians, experience is the best teacher of this science. . . . Every endeavor should be made to ensure that as far as possible the cadre of employees of statistical department remains unaltered and is not subject to changes every day."

2. Each worker must state frankly, when working on statistical data, the assumption which he makes, the definitions which he employs, and the exact source of his information.

3. There must be complete uniformity of method and definitions within a particular field.

4. Statistics are valueless unless they are precise, and general and incomplete statements must be disregarded altogether.

5. All persons concerned in the collection and analysis of statistics must have complete intellectual honesty; that is, the statistician at whatever level must possess that intellectual integrity which will not allow him to publish any figure which he knows to be inaccurate, incomplete or biased in any way. It is much better to publish no figures at all than those which are subject to such failings.

6. Careful attention must be paid to the design of forms, which should be self-explanatory to the person who has to fill them out and yet designed to be easily consolidated. In the case of forms used for punched card machines, columns should be included for office use so that code numbers can be inserted in place of verbal information, or the forms should be self-coding.

7. Collection of data in the provinces should not be left to an uninterested official without any statistical training, but should be done either by specific statistical employees or by personnel of an existing department who have been trained in the work and who have been made personally responsible for it.

8. The most up-to-date office methods should be employed and, in particular, office machinery should be used wherever possible. The statistical organization should lead the whole Government in its business efficiency methods.

9. There must be frequent and regular publication of figures, as statistics hidden away in a statistical section are of somewhat the same value as an unlighted lamp.

10. Graphic techniques should be employed where necessary; but graphs should always be simple, clear, and self-explanatory. Pictorial graphs are not recommended.

11. Instead of taking complete counts, sampling techniques should be employed. In the words of the United Nations Organization Sub-Commission on Statistical Sampling: "Sampling methods have many advantages. The cost is only a small fraction of that required for complete enumeration. The investigating staff required is much smaller, so that it is easier to give them necessary training and have the work carried out under adequate supervision. The results of a sample survey are available far more quickly, and it is possible to repeat a sample survey every year or at shorter intervals. By varying the size and design of the sample it is possible to secure results within any desired margin of error and even to exceed the accuracy of a poorly-planned and badly-administered complete enumeration. For these reasons extensions in the use of sampling methods offer great promise for the development and improvement of statistical information in all parts of the world."

12. Large statistical calculations, involving the analysis of a great many units of information, should be done on punched card machines. Many of those who read this report will be well acquainted with the principles of these machines as a result of economic, commercial or statistical training or experience. For the benefit of those who are not, however, it may be well to explain that these machines operate on the principle that all information about one of the units surveyed is first turned into terms of

numbers, and then placed on a card by means of punching holes to represent these numbers by their position. This is perhaps more clearly understood if we take the example of a population census. Here the unit on which information is obtained is the individual person, and about him we know a number of facts, some of which are numerical, for example, his age, and some written down in terms of words, for example, sex, religion and occupation. Information of this latter kind is coded numerically. Thus a cigarette machine operator may be represented by the number 587 and a Jacquard loom operator by the number 598. The card is divided into columns (normally 80 or 65, according to the make of machine), and, out of these, three columns will have been kept for the recording of occupation. In these columns, holes will be punched at the positions representing 587 and 598 on the cards respectively for the cigarette maker and the weaver. The point of putting the information on the cards in holes is that the cards can then be sorted by various classifications, analyzed, and the totals added up at a speed enormously greater than that of the human hand. The sorting machines, for example, will pass cards through at a rate of between 20,000 and 30,000 per hour. Almost no process in the analysis of data is beyond the capacity of punched card machines, which from a basic card (taking again the population census as an example) will, in a few simple processes, produce totals for a given area for each kind of occupation divided by male and female, sub-divided by age and so on. The speed and adaptability of these machines make them indispensable in the handling of any large statistical analysis, though to employ them on a small job is, of course, like using a sledge hammer to crack a nut. Installations of punched card machines have been recommended in this report as being of a high priority in the Central Statistical Bureau, the Customs Statistical Section and the Census. Certain investigations as to the need for other installations, for example, in the Tobacco Monopoly and the Railways, have also been recommended. Many jobs for several Ministries should, it is recommended, be handled by the pool of the Central Statistical Bureau.

Though these machines are expensive, this factor should not be allowed to influence the carrying out of these recommendations. Two types of punched card machines exist. The principal difference between the two types, which is radical, is that on one an electrical current is passed through the holes punched in the card in order to make the machine sort or register totals, while in the other a spring pin is passed through the hole for the same purpose. As a result of this fundamental difference the machines have slightly different aptitudes and speeds and sometimes a job can be rather more conveniently done on one than on the other. The techniques of placing statistical data on both types of machine are practically identical, except that occasionally the possession of a particular fitment by one or the other renders the process simpler in that case. It is not considered that either type can be conscientiously recommended in preference to the other; statistically there is in fact no objection to the Government of Iran employing both makes in different sections of any statistical organization, but since the holes cut in the electric type card are square, while those in the pin type card are round or oval, and since the former card has 80 columns while the latter has 65, the two machines are not interchangeable. Consequently, if two sections have to handle each other's work and assist each other, their machines must be of the same make. Hence, while the machines of the Railways, Tobacco Monopoly and the Customs can equally well be either type, the machines of the Census and the Central Statistical Bureau must be of the same make, whichever it be, since the Bureau will be required to do some tabulation for the Census.

DETAILED DISCUSSION AND RECOMMENDATIONS

In the following discussion and recommendations, which constitute the main body of the statistical organization section of this report, each type of Iranian Government statistics is discussed in turn. The general aim of such statistics, the present situation, and the faults or merits of the existing data are discussed; recommendations are made and a budget figure or source is given.

PHYSICAL

Cartographic Survey

The cartographic survey of a country, though a matter of scientific observation, is not in itself statistical in the sense that it produces organized, grouped, or analyzed numerical data. It would be possible no doubt to produce statistics of a sort concerned with geographical facts if we were to perform the somewhat pointless tasks of averaging the height of mountains or the lengths of rivers—a performance of little value or significance. But in a wider sense a cartographic survey is a statistical necessity, both having regard to the maps themselves and to the individual data obtainable therefrom. A population census, for example, cannot be organized without adequate maps; nor can agricultural statistics or land settlement records be firmly based without an exact knowledge of areas. Adequate mapping is integrally connected also with the production of statistical data in the fields of irrigation and forestry, quite apart from its other uses in these subjects. In a general sense an adequate cartographic survey provides the framework against which any extensive statistical survey of the country must be made.

Hence it is not irrelevant to introduce a note on the cartographic survey of Iran at this point. This relevance is increased by the fact that the specific budget for statistical work allocated in the Seven Year Plan is also that for topographic mapping, namely, a budget of Rls. 300,000,000 under Chapter 6 of the Plan Act.

Present Position

No survey department exists in the Government of Iran; and the maps at present in use are largely those of the survey of India of the British Army General Staff or based thereon. These maps include a series on a 1:1,000,000 scale covering the whole country, a ¼-inch-to-the-mile map covering most of Iran, a 1:100,000 scale covering the South, and a 1:250,000 map covering considerable portions. Extensive air survey work has also been undertaken in the south by the Anglo-Iranian Oil Company, and some of the air mosaics produced have been utilized for maps. The Census Department, as an essential preliminary to the taking of a census, is at the present moment engaged in producing maps for the whole country which are in the main enlargements and translations of the ¼-inch-to-the-mile map mentioned above with some local checking.

Recommendations

It is recommended in the portion of this report dealing with surveying and mapping that a survey section form part of the proposed Water Authority, and that this section undertake as an urgent priority three principal air surveys with subsequent mapping. These surveys are suggested having regard to the basic requirements of all sections of the Seven Year Plan. The most urgent needs are for large scale maps for irrigation development and agricultural programs, smaller scale maps for power and storage projects, forestry, and so forth, large scale town plans and small scale aviation maps. The recommendations specifically made include the mapping of 57,000 sq km at 1:10,000 to cover irrigation areas, a complete mapping of thirteen towns at 1:5,000 and a mapping of 111,000 sq km at 1:50,000, mainly in the Caspian forest belt and coast and the Sefid Rud and Karun catchments. In addition it is planned under civil aviation development to have maps in accordance with the International Civil Aviation Organization requirements for the greater part of the country, and to provide photo-mosaics and maps for geological exploration work.

It is desired to endorse here these recommendations and emphasize the urgency of this work. The areas recommended for mapping are those which from the statistical point of view it is most important to have covered; that is, the principal cities and in the main the most thickly populated areas (which are necessary for the census), and some of the principal areas required for agricultural surveys and irrigation and forestry statistics. The making of plans of the principal cities is from the point of view of the census a particularly high priority, and copies of plans, maps and, if possible, aerial photographs should be passed to the Census Department as they are produced. Since the census will probably take place in Autumn 1950 (1329), it is unlikely that more than a portion of the recommended mapping will have been completed in time, but that portion which is complete should be utilized by the Census Department in preference to their own outline maps. These census maps are, however, adequate for their purpose and their completion should in no way be delayed to await a proper air survey. Whenever the Survey Department is set up the Census Department must form a liaison with it to ascertain, for example, which town plans are likely to be ready in time for the census and to arrange the regular transfer of information. By the time the agricultural census (which is of much later date) is taken the survey work should in the main be finished, and proper maps will therefore be available to the Ministry of Agriculture in taking this census.

The Central Statistical Bureau should arrange to obtain areas and other geographical data from the Central Water Authority for publication in the proposed annual Abstract.

Budget

On the assumption that the civil aviation maps will be offset against the budget for development in that field, the budget of Rls. 300,000,000 for topographic mapping and statistics has been divided between the two subjects in the proportion of 220:80. The Rls. 80,000,000 has been treated in this statistical report as being purely for statistical purposes and is, in fact, wholly utilized under the headings of Central Statistical Bureau and Census.

Climatic Statistics

Climatic statistics are an essential part of the basic physical information without which it is impossible to plan the economic development of a country. Need of such meteorological information for the air services is immediately obvious, but it is equally great for

the agriculturist, the irrigation engineer and the transportation or industrial planner. Such meteorological statistics can generally be divided into two types:

1. Long-term climatological information which is of little value (particularly in a country with such a variable climate as Iran) unless it is available over a period of years. Such information covers wind, temperature, rainfall, humidity and snowfall, and it should be possible from it to derive both the extreme and the mean in each case.

2. High-speed daily forecasting information, primarily of importance to aviation and shipping but also in most countries issued in the form of weather warnings by radio broadcasts or in the press.

Present Situation

Unfortunately, although a modicum of information on Iran's climate exists—sufficient, for example, to let us know the immense range of precipitation and the extraordinary differences between the winter temperatures in the Elborz and the summer temperatures in Ahwaz—there is in general a serious lack of climatic statistics. Few records and these not of long duration—in a few cases 20 years—exist on the principal climatic phenomena. Such records as exist are maintained in three places:

1. The normal high-speed weather forecasting exists in the Department of Civil Aviation.

2. A number of climatic statistics associated with hydrological data are maintained by the Independent Irrigation Corporation which obtains, for example, some records of rainfall and temperature from the measuring posts on certain rivers, from which relation of rainfall to volume of water is calculated. Graphs, which are in themselves satisfactory and statistically sound, are constructed showing maximum and minimum temperatures, humidity and rainfall.

3. In a section of the Ministry of Agriculture further statistics of climate are maintained. These are obtained from a number of recording stations which send a monthly statistical report, while telegrams are also sent both to Tehran and to the Agricultural Department at the ostans giving information chiefly on rainfall and on exceptional circumstances. The sending of these telegrams does not appear to be confined to the meteorological stations, for more general qualitative statements are sent by agricultural officials. These cannot be of very much value for they are usually general remarks such as, "Heavy hail spoilt crops". Certain extractions are made by the Ministry showing rainfall by months for the principal stations, but there are many gaps; and it is not likely that strict application of the forms designed as part of the group of agricultural statistical forms will close these gaps unless the meteorological organization itself is made distinct and complete.

Recommendations

It is recommended in the meteorology section of this report that a proper meteorological organization be set up for the collection of regular climatic statistics. It is envisaged that the climatic data should be collected by independent meteorological service under the Ministry of Defense to deal with the needs of Agriculture as well as those of Civil Aviation. (See meteorology section of Volume III of this report.) The service will employ foreign specialists for a period.

From the statistical angle it is recommended that the functions of the new service should include the following:

1. The scrapping of existing forms and the devising of proper meteorological forms, uniform for every type of station.
2. The publication of monthly and annual meteorological reports, possibly by the Bank Melli.
3. The passing of regular information on climate to the Ministry of Agriculture and the Central Statistical Bureau on a monthly service.
4. The collection of snowfall records, which are particularly inadequate in Iran.

The relationship of the new service to the Central Statistical Bureau should be as follows:

> The Central Statistical Bureau will guide the meteorological service in practical matters; for example, requirements of the Central Bureau for publications in their Digest and Abstract; practicability of collecting certain data; assistance in design of cards and forms if required. The Central Statistical Bureau will also provide any technical facilities necessary, such as the use of machines and mathematicians. Routing of information to other Government departments should be watched by the Central Statistical Bureau in order to prevent duplicated effort.

Budget

This service should be budgeted out of the allocation of Rls. 36,734,000 included in the first item of Chapter I of the Plan Act, and therefore does not fall specifically against statistical funds.

DEMOGRAPHIC

Population Census

The figures of the population census are the most important of all statistical data for the proper government of any country. These statistics are not only of major import in themselves but form an essential element in many other statistical inquiries such as those on social insurance, education, crime, housing, labor, the national income and even the various censuses of production and distribution. In many less obviously connected fields a knowledge of the population is vital; thus it is difficult to assess the probable load on a municipal power plant unless we know the population of the city or territory served. To quote a report made by Dr. P. Granville Edge in 1945 to the Government of Iraq: "Reliable population data constitute the fundamental basis for all questions associated with the varied sources of national income and expenditure; schemes of education, of housing, and transport, of pensions and of all public utilities and benefit, must rest upon the accurate knowledge of existing population conditions as furnished by the census. They are an aid to estimating the degrees of growth or decay of prosperity in various parts of a country, a measure of social, economic and industrial conditions between place and place. They are an indispensable requisite for the compilation of parliamentary registers and the constitution of electoral areas. The national census is, therefore, an instrument of Government devised for the benefit of the nation as a whole and, directly or indirectly, for the benefit of every individual member of the nation."

The importance of a population census, therefore, cannot be overemphasized. That the need for this was clearly present in the minds of those responsible for initiating the Seven Year Plan is shown by the fact that from the beginning a census has been an element in the Plan; and in H. E. Dr. Musharraf Naficy's original report Rls. 200,000,000 were allocated "for the preparation of statistics by census and for the police system". This figure has since been altered and in the Seven Year Plan budget a sum of Rls. 300,000,000 is allocated in Section VI for "Topographic Mapping and Statistics", the intention being apparently to cover the major costs of the population census.

In a country such as Iran, which is larger in area than England, France, Italy and Spain combined, and in which the population is most unevenly distributed, a population census is a major undertaking and one which it is unlikely the Government can finance from its regular revenues. Moreover, the Plan itself cannot be controlled adequately in its later years without a knowledge, not merely of the number of people in the country, but of their various attributes, that is, age, sex, marital status, literacy, occupations and the like. The true natural increase in population is of immense importance in the later stages of the Plan and in its budgeting throughout. It is therefore fitting that the population census should not only be included as a major item in the statistical part of this report (as all types of statistics have been since it is desired that their development should be under the authority of the Plan) but that the census should, in fact, be one of the Plan's specific projects. It is desired to emphasize this point at the outset.

Present Situation

The population statistics at present existing in Iran are handled by the Civil Registration Department of the Ministry of the Interior. These are, primarily, estimates, though certain parts are based on a previous census. They are not claimed, even by the Department, to be in any way accurate; for, where some accuracy did exist in the previous census, the figures have gone out-of-date as a result of the heavy population movements caused by the war and the normal increase in the number of the people. Any subsequent counts have been taken for rationing purposes and may possibly be inflated. The examination of the work of the Department may be divided best into a number of heads.

The Organization of the Department

The Department of Census and Civil Registration is the largest single statistical department in the Government and forms part of the Ministry of the Interior. On the technical side it is divided into three branches, namely, Census and Statistics, Nufus (which is actually the civil registration office proper and is dealt with in more detail in the subsequent section of this report) and Civil Registration—which is in fact a semi-legal division and which is also dealt with later. In the present section we shall be concerned with the work of the Census and Statistics Division only, and we need not therefore examine here the chain of command in the provinces. The Census and Statistics Section had a staff of about 40 people when examined, of whom 10 were maintaining the ostan registers, 10 were preparing tables on derived statistics and causes of death, some were preparing maps for the new census and others were in on a number of miscellaneous jobs.

Existing Population Statistics of a Census Character

Until a few years before the war no census existed in Iran and there is apparently little history of organized counts. In 1320 (1941), however, the newly-formed Census organization took a census in 35 cities, carrying out the

work on the synchronous house confinement principle. This census appears to have been well executed and rapidly consolidated; some results have been published of which a volume issued in 1326 (1947) for Isfahan is an excellent specimen; but the remaining results have been only partially analyzed and the forms are still held by the provincial bureau. In taking this census the countryside was not covered except for the immediate neighborhood of the cities. Since the date of this census a number of rationing figures have been made, but with the exception of the last of the Tehran counts these figures are certainly very unreliable and the Census Department has wisely not used them.

Therefore, the principal population statistics existing, and certainly the most accurate, are those for the 35 cities. The Isfahan analysis is a particularly good example and indeed might be used as a model for preparing the next census. The volume covers not only an analysis of the main figures, the ages, number of literates and illiterates, nationality, occupations, physical deficiencies, visitors to the town, and so on, with graphs, but has what is normal in a well-prepared census volume, that is, a description of the city and its geography and history.

In addition to the figures for the cities, the Statistical Section of the Census Division maintains registers showing for each village the number of men and women in 1320 (1941), based apparently on registrations at that date plus an estimation system. In various columns the excess of births over deaths (minus in red) in the village in each intervening year is shown, and these columns give a running total which has been carried forward to about 1324 (1945). These figures are claimed by the Census Organization to be only approximate. In 1322 (1943) a volume was published showing the total populations of ostans and names of villages, but it was decided not to show the population of each individual village since it was in the nature of an estimate. The books showing the running figures are not completely up-to-date.

Centralization Scheme

Following a decision of the Supreme Council of Statistics, the Statistical Section of the Census Department last year commenced efforts to centralize in itself a number of statistics with the aim of publishing a Statistical Abstract. Contact was made with other Ministries who were asked to submit statistics, and a set of agricultural census forms was drafted. This action was justified by its supporters on the grounds that the Department has employees in many villages who know the area well and that there was at that date no strong existing Central Statistical Bureau.

Preparations for a New Census

The Census Department is fully alive to the fact that a proper and complete census of Iran must be taken shortly. The Government has in fact decided that this census will be taken in 1950 (1329) to agree with the proposed UNO World Census. The steps so far taken towards this are sound. Detailed plans are being made of all cities, and at the same time smaller plans are being made for each dehistan showing the practicable linking of the villages and the centers from which the census work will be carried out. An endeavor is being made to ascertain the transport means available and the telephone and telegraph facilities. It is proposed to produce line plans of each village, so as to allocate groups of houses and streets to the various enumerators; but these and the house and street numbering are not yet advanced. At the

same time an attempt is being made to map the whole country based on the British Army map, which is being enlarged in outline, translated into Farsi and checked by local employees so as to give a general map against which the individual plans can be set.

The design of the forms is also well advanced, and either from the earlier census or the plans in draft the following exist:

1. A booklet of instructions for census-taking giving the general organization in the country, the methods of registering and controlling employees, a system of compiling books for registering houses and families before the census, instructions on the numbering of streets, the distribution and completion of individual forms and the main tables which should be compiled.
2. The family envelope.
3. The control sheets.
4. The individual census form.
5. Forms for communal residences, that is, barracks.
6. A volume containing a list of occupations with code numbers.

There is also in existence an interesting and useful book on statistics and census-taking compiled in 1313 (1934) by Mr. Sayfullah Navab.

The plan of action for taking the census is at the moment as follows:

1. Completion of maps of the country and plans of towns and villages.
2. Numbering of the streets and houses and completion of build-up of the census organization.
3. Preliminary listing by the augmented census staff (and apparently by the enumerators also in advance of the census date) of the actual houses in each enumerator's area and the number of families and persons therein.
4. Check of these lists by a supervisor, and distribution of individual forms just before the census date.
5. The filling in of all these forms in advance of the census mainly by the enumerators except when the head of the house is literate.
6. Collection of the forms on the actual census day when everybody will be compulsorily kept at home and when all the details on the forms will be checked again. New forms will be filled in for arrivals since the distribution date, and the forms for those who have moved will be cancelled.
7. Consolidation by the census staff into the appropriate tables, which it is apparently considered can be compiled in the ostans.

Recommendations

It is desired to emphasize at the outset the absolute necessity for a census of population in Iran. As has been indicated in the opening paragraphs of this Section, the population census is the most important of all statistical projects, since virtually all the other statistics of a Government gain most of their meaning and significance by being related to the number of the population. Whatever economies, therefore, are made in the Seven Year Plan budget, the omission or reduction of the census should not on any account be one of them. In the Middle East Statistical Conference of 1943 (1322) the supreme

importance of accurate population figures was emphasized, and the Conference recommended to all Middle East countries as follows: "Considerations of expense should not be given an over-riding importance in this matter. The Conference emphasizes the importance of an early census of population in Middle East countries as a basis for post-war development." Iran is now concerned with the largest and most co-ordinated scheme in the Middle East for that post-war development which is mentioned; above all countries, therefore, Iran must take an early and complete census of population. This must, therefore, form a major part of any statistical plan under the Seven Year Plan, and every modern method must be employed to make it a first-class operation. Thus, for example, the preliminary organization must be excellent and the consolidation must be done by the use of punched-card machinery. Preparations must start early, for the average census requires two years' preparatory work; yet the census must be so timed as to fall some time in 1950 (1329) to agree with the proposed UNO World Census.

The recommendations below should be followed both in regard to the actual mechanics of the census itself and in order to produce an organization which is at once up-to-date in its present work and capable of carrying out this large operation.

Organization of the Civil Registration Department

The names of the sections of this large Department should be changed in order to indicate their function more clearly. It is suggested that the Census Section proper together with the machine bureau, that is, the staff concerned with the actual preparations for and eventual consolidation of the proposed census, be separated from the Statistical Section which maintains current statistics, and that the four sections resulting be called respectively:

Census

Statistics

Civil Registration

Legal

The first two sections will be formed out of the present Census and Statistics Office; Civil Registration will be the new title of the present Nufus Department; and the Legal Section will be that which is at present called Civil Registration. This, it is thought, will bring out the functions of the Department more clearly; Nufus is, in fact, the Arabic word for people or population and is not very descriptive of the activities of what is in fact the civil registration record office.

The functions of the four sections will be:

1. A Census Section which will handle the organization, control and consolidation of the census proper. When the Census Section has added up the last figures and published the last tables, it will be reduced to a mere skeleton as the framework awaiting the organization of the next census. If the first census has been good, the next should be taken in 1960 (1339). When the consolidation is complete, the machine bureau will be dissolved unless it is desired to keep a few machines for the maintenance of mortality statistics, in which case these will be attached to the Statistical Section. The original forms of the census and the detailed tables, in so far as these have not been published, will be retained by this skeleton Census Section, which will already have provided sufficient data to the Statistical Section to enable it to maintain running figures (see below).

2. A Statistical Section which will deal with consolidation of figures of births and deaths, maintenance of running totals of population and publication of a mortality and population bulletin. This Section should be equipped with two adding-listing machines and one calculating machine. Its personnel must be improved and one or two members must be sent abroad for training in population statistics. Further details of the organization and work of this Section will be found under Mortality Statistics later.

3. A Civil Registration Section (formerly Nufus), which will have the functions described under Mortality Statistics.

4. A Legal Section (formerly Civil Registration), whose functions are also dealt with below.

Handling of the Existing Statistics

As soon as the census organization proper has been separated from the Statistical Section, the latter must be sufficiently staffed in order to bring up-to-date the running figures of population, which are at the present moment badly behind. These figures are not of great importance in view of the proposed new census, but the work should be cleared before this new commitment arrives. The figures are in any case needed for the first stages of the Seven Year Plan, and if necessary overtime should be worked to bring them up-to-date. In doing this it should always be remembered that the figures should be used with great caution (the Department itself wisely does not guarantee them) and that no statistics should be issued for an area smaller than a bakhsh, as the movements of population mean that village figures can never be quite accurate; for example, changes in the water supply may result in depopulation in a given area. This work should be co-ordinated with the work on mortality returns which is dealt with in more detail under mortality statistics.

Centralization Scheme

The scheme which was proposed in 1327 (1948) for the centralization of statistics under the Census Department (and in particular for the handling of an agricultural census) has not, to date, advanced very far. It is very strongly recommended that the Census Department should entirely cease from this attempt to centralize in itself figures unconnected with the population census. The work on agriculture is a gross duplication both of that carried out by the Agricultural Sub-Section of the Bureau of Research and Statistics of the Plan Organization, and of that of the Statistical Section of the Ministry of Agriculture. The centralization of statistics would be at the moment less of a duplication, but under the plan for statistics in the present report the overlap of functions would be equally serious. A centralized statistical bureau must indeed be built up, but the place for it is not the Ministry of the Interior nor the Census Bureau therein—which after all is not yet up-to-date with its own consolidations and has not achieved a complete system of civil registration. It will require all the powers of a much-enlarged census organization with more technically-equipped staff and modern machinery to organize and carry through the enormous task of taking the population census. This, the primary and most important task, is one which the Census Department should be proud to execute without bending its energies to other matters, the handling of which will be found to be less satisfying in any case. The Census Department should publish its own population bulletin and the results of the main census, but not any general statistical abstract as it appears to envisage. The forms drafted under the auspices of the Council of Statistics for an

agricultural census should not be utilized by the Department but should be handed over to the Ministry of Agriculture which can employ their (in general) sound design.

In sum, the taking of the census is a great and inspiring task of first-class importance and immense complexity; these figures are more important than any others in the Government and the Department should not seek further fields. A centralized bureau should be with the controlling organization of the Plan and should have the double function of collecting and publishing the completed statistics produced by all Ministerial statistical sections and of performing operations on their basic statistics which these sections themselves lack the technique or the equipment to carry out.

Additional Preparations for a New Census

1. As a preliminary step the staff organization of the census should now be drawn up on paper; it should show the personnel required for the central office of the census and the provincial organization down to the smallest supervisory unit. Employees should then be selected from the most promising among the present staff to be provincial directors or heads of sub-sections in the main census office, and to this number should be added several keen and well-educated young men recruited from other Governmental departments. This group should then be sent abroad to study census work in countries other than Iran. Those so chosen should preferably speak a foreign language. The countries suggested for visiting are Iraq (which is in the process of machining its first census and is therefore a very interesting study), Turkey (which took a census in 1945), Pakistan and India. Conditions are so dissimilar in the Western European countries and the United States that there is not much point in personnel visiting these countries, particularly since the operation of electric type tabulating machines can be seen in India and pin type tabulating machines in Iraq. The Director-General of the Iraq census has expressed his willingness to meet the Director-General of the Iranian census personally to make arrangements for such a delegation, and has offered to perform again the census operation in one or two small towns or village groups as well as in a small difficult area; for example, tribal territory or marsh land. This will be a valuable demonstration to the delegation, who can participate in this work as if they were members of the staff. This offer provides an admirable opportunity for training which should not be neglected.

   At the same time as these key personnel are being trained, the lower-grade supervisory staff should be instructed by classes in all the details already set out in the census instruction pamphlets, and given some information on methods of census-taking in other countries. As nearly all the employees of the Civil Registration Department will be at least junior supervisors (since the rank and file of the census-taking personnel either will be specially recruited for the period over the census or will be merely enumerators employed for a day or two), it would seem best that these classes should embrace the whole of the present Civil Registration staff.

2. It is absolutely essential that a foreign adviser should be appointed to assist in the carrying out of the census. The present senior responsible personnel are undoubtedly just as capable of administering their departments as any foreign adviser; but their organization is the largest statistical body in the Government and the Director-General himself as well as the official specifically directing the census has many functions to per-

form. The appointment of a foreign adviser will permit these officials to concentrate to a greater degree on the administrative control (which is equal to that of a chain store spread over the country or a large factory). The adviser will be able to concentrate on the purely technical aspects and to bring to the census organization the benefits of his experience in other countries and a knowledge of the most modern methods in census technique. It must always be remembered that while the 1320 (1941) census was unquestionably a success, it was confined to towns and did not cover the country-side, in which special problems are involved, and that it was taken several years ago so that few of the existing staff will have benefited by that experience. There will be problems which the Census Department has not yet met.

It is specifically recommended that this adviser should be British, with experience of census-taking in British Colonial territories or other areas in which the operation is difficult. He must be at the highest possible level and should be engaged for a period of three years, that is, one year before and two years after the fixed date of the census. In order to obtain a man of sufficiently high level he will have to be offered a salary of not less than £2,000 ($8,000) per annum, and a further sum should be budgeted to provide him with an adequate local allowance in rials, and traveling expenses to and from the country (which are bound to be large). To this should be added a substantial sum in rials to cover contingencies, purchase of equipment and so on; there may be unforeseen expenditures; or it may be impossible to obtain a sufficiently high-level adviser without paying him a larger rial local allowance. To cover all the foregoing the very lowest estimate is Rls. 1,000,000 for the period of the census.

Before this adviser leaves Britain he should be informed of the following points so that he can consult the best authorities, obtain equipment and books, sample forms of the same type and so on:

a. The dates of the Census.

b. The approximate limits, higher and lower, of the number of families which each enumerator will have to handle.

c. The system of house registration.

d. The questions on the schedule.

He should be given authority to spend, say, up to £100 in Britain on books, office equipment, samples of recent census, a calculator, slide rules, drawing equipment, stencils, inkless pens, samples of stationery, crayons, etc. He should also be informed in advance as to whether he will be required to write part of the main census report.

3. It is recommended that map making activity be continued but that it should be limited to:

a. The reproduction on a larger scale of the British Army maps, purely in line and without contours and with the names translated into Persian; some local corrections can also be made, but there should be no attempt to produce a new cartographic survey of Iran.

b. Detailed street plans of the larger towns.

c. Outline plans only of villages and small towns; here again the objective should be limited. An official should visit the village and make quite a rough plan of the lay-out of houses, a task which should occupy him for only an hour or two. Nothing elaborate is required. It is thought that the present plans for the census envisage rather over-elaborate and extensive map making.

It should be noted that in the surveying and mapping section of this report certain complete cartographic surveys are recommended. These will be done by means of air survey and are as follows:

a. 57,000 sq km at 1:10,000 covering important irrigation areas.

b. The following towns at 1:5,000—Tabriz, Resht, Hamadan, Kermanshah, Ardebil, Isfahan, Rezaiyeh, Yezd, Kerman, Kazvin, Ghum, Shiraz and Arak.

c. 111,000 sq km at 1:50,000, mainly in the Caspian forest belt, Caspian coast Sefid Rud catchment and Karun catchment.

All these maps, as well as any maps compiled in the south by the Anglo-Iranian Oil Company, should be utilized for the census, and liaison should be made early with the Oil Company and with the survey department of the proposed Central Water Authority whenever this is established. Not all these maps will be prepared in time for the census; but those which are will be immensely valuable and should be adopted instead of any Census Department maps. By establishing early liaison the exact areas can be found and consequently the Census Department can dispense with making maps of those areas which will be mapped in time.

The plan of action for taking the census (as set out earlier) seems admirable, and it is recommended that all the preliminary steps of mapping, numbering of streets and houses, build-up of staff, listing of houses in anticipation of the census, preliminary check, advance completion of the forms and actual taking of the census be carried out exactly as designed. It is not recommended, however, that the consolidation should be done either entirely by hand or in the provinces as is apparently envisaged. However quickly the census of 1320 (1941) may have been added up in the provinces it will be found:

a. an almost impossibly heavy task; and

b. a source of inaccuracy, if the forms are consolidated locally on this occasion.

It will be remembered that in 1320 the whole resources of the census organization were being concentrated on only 35 cities. Cities are infinitely easier to deal with than the countryside, and the countryside in turn easier than the tribal areas. It must also be pointed out that, satisfactory though the tables of the 1320 census are, they are not by any means in the full detail which must be produced if the great expense of this nation-wide census is to be justified. Thus, it is not sufficient merely to have a simple table showing for each census area the total number of single men, single women, married men with one wife, two wives, and so on, married women, widows, widowers and so on, subdivided by age groups. It will also be necessary to sub-divided these again by religion and possibly by other factors. The complication in producing tables with so many links would soon prove beyond the capacity of officials.

All that should be done in the provinces, therefore, is

a. the primary count of the total number of males and females for the census area, which will be put on the outside of whatever folder or envelope the enumerator uses and then totaled by the supervisor for his area and so on up the chain of command; and

b. possibly a further primary analysis by the census officials in the provinces, who will extract totals by marital status and possibly age group.

No more than this should be attempted in the provinces. The forms should then be sent to Tehran where they will be consolidated and analyzed in the greatest detail by the Census Bureau, utilizing the most modern technique and punched-card machinery. Since it is clearly the intention of the Census Department at the moment to consolidate the census on the decentralized basis, the opinion that this is wholly wrong and the recommendation that analysis be centralized using punched-card machines cannot be too strongly emphasized or too often repeated.

5. It is not desired in this place to comment in detail on the instruction books and draft forms which are already in existence, because these appear in general to be satisfactory and very clear. It is thought that the duties of each type of official should, however, be very clearly specified. It is recommended that the general outline of the forms as already designed be accepted.

6. The principal questions which should appear on a census schedule are:

   a. Name and family name
   b. Relationship to head of household
   c. Address
   d. Type of residence
   e. Sex
   f. Date of birth
   g. Place of birth
   h. Marital status
   i. Nationality
   j. Religion
   k. Industry in which employed
   l. Exact occupation in that industry
   m. Literacy
   n. Principal disabilities, for example, blindness.

As far as possible the questions should be limited to the above, for any more detailed questions will either cause suspicion (for example, questions on income will cause a fear of taxation) or will be beyond the capacity of the individual to answer and the enumerators to record. The heading "disability" may be widened to assist the needs of the public health organization, but if

so, lists should be supplied to the enumerators of the specific diagnoses which they have got to make. In defining "occupation", it will be necessary to bear in mind the needs of the distribution section of the Plan Organization. It may also be possible to add "mother tongue" and "tribe to which allegiance is owed" if these questions are thought practically and politically feasible. They will certainly provide very interesting information. As far as possible the exact date of birth should be given if known and, if not, an approximate date must be given; this will be necessary for any actuarial purposes later under a social insurance scheme. It might also be desirable to put "age last birthday" on the form in a separate box since this is simpler for the punching process on the machines. In defining occupations, the closest attention must be paid to the recent UNO International Standard Industrial Classification of all Economic Activities, as well as to the occupation volume already issued by the Census Department. It is vital that before the census schedule is drawn up the following documents be very carefully examined:

a. Document E/571, being a report of the Population Commission of the United Nations, which gives a proposed list of questions for a census schedule. In considering this document it must be remembered that slightly different lists of questions will be required for persons living in institutions.

b. The following in the United Nations series of Studies of Census Methods:

No. 3—Problem of Defining, Identifying and Measuring the Agricultural Population.

No. 4—The Labor Force: Problems of Census Definition and Enumeration.

No. 5—The Investigation of Sex, Age, Marital Status and Educational Characteristics in Censuses of Population.

No. 6—Birth-place, Nationality or Citizenship and Language: Problems of Census Enumeration and Definition.

In counting the tribal population it may be necessary to employ slightly different questions, since sometimes the tribal chief will have to give estimates for his whole tribe. It is recommended that some attention be given to papers published on census operations in sparsely-occupied areas, for example, by Professor Wilcox of Yale University.

7. Following are additional detailed recommendations for preparation for the census:

a. It is essential that the census be preceded by a long and careful propaganda campaign. There are many factors which may cause suspicion in the mind of an illiterate population being counted for the first time. They may be afraid of conscription or extra taxation or they may anticipate some special benefit such as an increase in rations. There may also be other prejudices. Any of these beliefs would bias the census.

A long period of preparation may result in the spread of rumor and of misleading views as to what are the aims of the Government; landowners may not wish to have the population in their area counted exactly for various reasons; political motives may enter; tribal chiefs may be very hostile since they may feel that an attempt is being made to reduce their freedom or they may think that their tribe will emerge from the count as appearing less important than they wish it to be.

Superstitious influences may enter; for example, women sometimes believe that ill-luck follows the count or that to state the exact ages of their children will threaten their lives. The support of men influential in the thought of the country, for example, religious and cultural leaders, should be early brought to bear on behalf of the census. There should be preliminary explanatory broadcasts, and even propaganda visits and speeches should be made by officials. Posters should be distributed well in advance of the census, and final broadcasts (with the texts distributed on handbills) should be made by the very highest personages in the land.

b. It is desired to make an additional recommendation which is both of a financial and propaganda nature. It is thought that a special issue of postage stamps should be made shortly before the census. Part of the costs of the census can be covered by such an issue if the use of the stamps is made obligatory and they carry a slightly higher charge than normally, the excess over the usual postage rate being put into the census funds. Alternatively, even if the stamps are not used as a means of raising revenue, that is, if there is no surcharge (and even then the philatelic sale will produce some extra revenue), they will be valuable publicity for the census and may perhaps even be used as a means of instructing the people by the illustration of suitable scenes. The philatelic purist may say that special sets of stamps should not be issued on the least possible excuse purely for a non-postage or revenue purpose; but the first census of the country would seem to be a justifiable occasion. It is interesting to note that in 1945 (1324) Turkey issued a set of national census stamps with four values, all in one design of hands filling in the census form. For Iran a longer set might be issued showing in one or two designs scenes from anything equivalent to a census in Iran's history. The designs on the lower values which circulate more freely and therefore have a propaganda importance would show the census form, enumerators visiting houses, and so on.

c. While the census is being taken it might be worth while making a special study of the efficiency of the enumerators as was done during the U. S. Public Health Survey in 1935 (1314).

d. The exact date of the census must be very carefully chosen. It must be after the tribes have returned from their summer migration but before the rain and snowfall commence. Probably the end of October 1950 (Aban 1329) would be a good date. As far as possible in all towns, villages and settled areas the census should be synchronous.

e. The enumerators should always be chosen from persons habitually living in, and familiar with the inhabitants of, the particular locality where they will work. Apart from the permanent personnel, the temporary supervisors must be chosen from Government officials, municipal officials, schoolmasters and so on already in the area, and they should be paid a small extra sum for their work. The enumerators, who will be employed for two or three days only, will be found among the school teachers, senior secondary school students, educated clerks, local officials and the like. It was particularly noticeable during the Iraqi census that the young men realized more than the older men that they were participating in what was almost a missionary enterprise from the point of view of the future of the country, and that quite young secondary school students were amongst the keenest and most conscientious operators.

f. A census law or decree must be passed.

g. Before the census is begun the building for the head office must be absolutely complete and prepared.

No more than 15 to 20 enumerators should be in a "circle", that is, under one supervisor. Supervisors will be purely temporary officials and the permanent officials will start at the grade above this.

h. It must be made clear on the census form and by the enumerators that the personal particulars given will be kept secret as far as the individual is concerned.

i. Foreigners should have a differently-colored form and so also should institutions, which will require a special form in which all the personnel therein can be grouped.

j. The preliminary numbering should cover all habitable structures.

8. It must be noted that all the recommendations on the improvement of staff, and so forth, apply to the civil registration (mortality) organization. A method of making a new set of identity cards and a completely new start with the civil registration system in conjunction with the census is outlined under mortality statistics.

9. Consolidation of the data must be done by machine. The occupation code must be worked out carefully in advance on the basis of the volume already published and the UNO Code List referred to above. Reference should also be made to the UNO Population Commission Studies in Census Methods No. 1, which deals with the relations between the census and the estimate of the agricultural population. Reference should be made also to the proposed list of contents of a Demographic Year Book outlined in Annex 1 of the UNO Population Commission, Document E/571.

10. It is very strongly recommended that an installation of punched-card machines be at once ordered for the census, since, owing to some delay in delivery of both types, a few months will elapse before installation. These machines are the only instruments now employed in any advanced country for the tabulation of a census. They can produce far more complex, detailed and accurate results than any hand method can hope to achieve even though a vast staff is employed. For the Iranian census as many as 30 punches and 30 verifiers will probably be required and several sorting-counting machines. An estimate of the cost has been entered in the budget section below. An ingenious method of employing these machines in Cyprus is described in the Journal of the Royal Statistical Society, Volume CX Part II 1947 page 138. In utilizing these machines a very careful flow chart must first be drawn up. Cards will be punched for every one of the persons in a particular census area (which should also be equivalent to an administrative area) and these will then be sorted into male and female packs, which will again be sorted to divide Iranians from foreigners. Each pack in turn will then be passed through sorting-counting machines; for example, male Iranians will be sorted first by religions on an ordinary sorter and then within religions by ages. The individual sub-packs will then be passed through a 3-bank sorter or equivalent machine to obtain such tables as shown in Exhibit P-1.

The importance of utilizing these machines is very great; they form the only modern method of consolidating a census.

Budget

The Census Department has worked out and submitted for authorization a budget as follows:

Numbering houses and preliminary plans (in line) of villages	Rls. 10,000,000
Transportation expenses:	
Purchase of 150 jeeps at Rls. 100,000 each	15,000,000
Wages of 150 drivers for running and maintenance of jeeps at Rls. 3,000 per month estimated for a period of 2 years	10,800,000
The expenses of fuel, repairs and maintenance estimated at Rls. 200 per day per vehicle for 2 years	21,600,000
Printing costs for forms, booklets of instruction, propaganda and new identity cards	20,000,000
Long-term supervisory staff—1,500 persons for 10 months at Rls. 3,000 per month	45,000,000
Subordinate supervisory staff for shorter period of 2 months—8,000 persons at Rls. 3,000 per month	48,000,000
Enumerators for 1 week—estimated to be required 100,000 at Rls. 50 per day	35,000,000
Grand Total	Rls. 205,400,000

This has been stated as a general figure of Rls. 200,000,000.

The details of this budget have been discussed with the Census Department on several occasions with a view to determining how much of the costs of the census should be borne as a special project by the Seven Year Plan and how much should be made the subject of a special guarantee by the Government to the Department. It is quite clear that any funds which the Seven Year Plan can provide will be insufficient for the whole cost of the Census, and it has therefore been agreed in these discussions that the present Report should recommend a grant to the Seven Year Plan of a budget sufficient to cover certain special costs which the above census budget has omitted, including all those involving foreign exchange. The Census Department will then ask the Government for a credit to cover the remaining cost of the census in accordance with the budget set out above, subject to any reductions and economies which may be effected. Two criticisms must be made here of the census budget set out above:

1. It takes no account of the use of punched-card machines for consolidating the census and does not provide any budget for a foreign adviser. The recommendation of both has been very strongly made above and it is considered that a sum of Rls. 25,000,000 should be allocated by the Seven Year Plan from the statistical and topographic mapping budget under Chapter 6 to meet these costs. This is additional to whatever budget the Census Department obtains from the Government.

2. The residual, that is, Census Department, budget appears to be too high for the following reasons:

   a. It is based on a delay of two years between the granting of the budget and the taking of the census; whereas if the census is to be taken in Aban 1329 (October 1950), only about 15 months will elapse. It is true, as said above (this must be reiterated here), that two years should pass between the commencement of the building up of a census organization and the actual taking of the census; but Iran has already taken several steps along the road of preparation. It should be possible now to prepare the census in 15 months (but, to allay criticism of the Census Department it is important to add,—not less), to which should be added a period of maintenance of the full organization for three months after the census date in order to arrange the forms, pass them to Tehran and renew the identity cards (see Section 2 of this chapter below). On this basis most of the budget estimates should be made for 18 months, which will reduce the cost.

   b. If assistance can be obtained from other Government Departments in providing staff at a small extra charge, the costs of the census may be further reduced. It must be clearly understood, however, that "if" is the most important word in this sentence and that most of the economies depend upon the free and full co-operation of other Ministries (who will, after all, be users of the figures).

   c. The estimate of staff required may perhaps have been made on the theory that consolidation will largely be done by hand in the provinces. The costs of consolidation can now be deleted from the above budget estimate since they will be carried by the allocation from the Seven Year Plan for the machine bureau recommended above.

3. The following recommendations are therefore made in regard to the budget for the census operation:

   a. Budget to be provided by the Government direct to the Census Department.

   b. Numbering of houses and preliminary plans—retain as stated. (The sum of Rls. 10,000,000 should be sufficient to cover traveling expenses of officials, and so on.)

   c. Transport—purchase of jeeps—The number of jeeps appears correct, but it is suggested that not all of these will be retained permanently by the Census Department after the census and that something should be included as a credit for re-sale value.

   d. Wage of drivers—It is thought that the sum allocated for this should be reduced to three-quarters since the estimate has been based on a requirement for these drivers of two years, whereas they will be required only from the granting of the budget to three months after the date of the census, that is, a period of 18 months. Thereafter, even if they continue to work for the Census Department, they will obviously become a charge on its ordinary revenues. They will be required during the three months after the census for the issue of identity cards.

   e. Expenses of fuel and maintenance—This also should be reduced to three-quarters for the reason given above.

f. Printing—The sum for this seems high, but if propaganda be also covered by this, the whole allocation may be necessary. Revenues from the issue of postage stamps can be set against this as as credit.

g. Supervisory staff—The figure of 1,500 for ten months is agreed; but 500 of the staff should be engaged for a longer period (so that they can carry out mapping and act later as controllers of more widespread areas) and the residue should be employed for a slightly shorter period. It is suggested that 150 persons be employed for 15 months before the census and three months after, 350 for 12 months before the census and three after, and 1,000 for four months before the census and three after. The latter 1,000 will be concerned, not with mapping preparations, but with the number of houses, and so on. All the available personnel will be required for the three months after, during the issue of identity cards.

h. Junior supervisory staff—The estimate of 8,000 persons for two months is agreed in so far as cost is concerned; it is thought that a more valuable result could be obtained by employing not a whole-time staff but Government officials as part-time staff, paying them somewhat less and utilizing them over a longer period, namely, two months before and two months after the census (two months should be adequate for their share of the street numbering and the organizing of the comparatively small teams which they will control, that is, about 12 enumerators only). These junior supervisors will be of immense value in completing the issue of identity cards in the two months after the census. Hence, it is suggested that the same number be employed part-time at half-pay for twice the period.

i. Enumerators—The estimate of 100,000 may be slightly excessive and it is probably with a view to effecting consolidation in the provinces that it is intended to retain their services for a week. In most censuses it is found that the enumerators are required for three days only, namely, two days for briefing and the handing out and initial completion of the forms and one day (the actual census day) for taking back the forms. On this basis, three-sevenths of the sum budgeted should suffice even if we keep the number of 100,000 enumerators.

It will be appreciated that the above recommendations are more in the nature of suggestions for lines of economy to be explored than hard-and-fast recommendations. Without making a study in detail of the census alone over a fairly long period, it is impossible to state in a report such as the present one that the estimates of the Census Department (which, after all, has a long acquaintance with the subject) are wrong or that the above suggestions are necessarily right. But it is thought that difficulty may be experienced in obtaining a budget of the order of Rls. 200,000,000 in addition to the allocation from the Plan in 4. below; and consequently the Census Department should consider very carefully whether economies cannot be effected on the lines suggested. It would certainly seem that if we reduce the estimate of the period of preparation, we shall save money on transport. If the appointment of the supervisors be phased as suggested to allow one-third to carry out mapping over a long period and the remaining two-thirds, acting in a subordinate capacity, to organize their districts and arrange the house numbering over a shorter period, it would appear that the money would be better spent. The same applies to the sum for junior supervisors, and economy can also be effected in regard to the enumerators. These economies should not impair the efficiency of the census organization since they are purely based on questions of time and the paying of attention

after the census to the issue of identity cards only and not the consolidation. The sum saved might be about Rls. 32,000,000, that is, rather more than the sum estimated for the machine bureau and foreign adviser together under 4. below.

4. Rls. 25,000,000 of the Plan budget is allocated for statistics in the census of population as shown in Exhibit P-6. It includes the rental and maintenance of a large machine installation, 20,000,000 cards, a foreign machine supervisor, a foreign census specialist, and an Iranian staff of 100. It is believed that the work might be completed in less time, but the allocation has been made over a three year period.

Mortality Statistics

It is a well-known principle that it is useless to build up or maintain an organization for taking a population census unless at the same time we have an adequate civil registration system. Such a system together with a statistical section forms indeed the continuing or permanent part of any census and civil registration department, and provides the means whereby the data of the basic census can be kept up to date, so that running figures are always available for the population of any given city or area.

It should be noted that the word "mortality" is here used in the correct technical statistical sense, namely, to indicate the statistics of births, deaths, marriages and divorces, that is, the basic, vital statistics on human beings. The term "vital statistics" can, however, be somewhat loosely used to cover not only mortality statistics as above but the statistics of morbidity, that is, incidence of disease or the state of the people's health. Since it is desirable to group with the statistics of disease all those concerned with the public health organization (which might include administrative statistics), it has been preferred in this report to avoid the somewhat general term "vital statistics" altogether and to use the words "mortality statistics" to cover the figures of births, deaths, and so on, and the phrase "public health statistics" to cover both morbidity and the administrative figures of a public health organization.

The importance of good mortality statistics cannot be overemphasized. The number of deaths in an area is an indicator of its health condition when taken in conjunction with the total population, and immensely valuable conclusions can be drawn from the proportion of deaths to the number of males or females at various ages. The number of deaths of children under one year (calculated per thousand live births to give the infant mortality rate) is one of the most revealing indications of a nation's health and sanitation conditions (where known it is appallingly high in the Middle East), and the figure of births set against the number of women of appropriate ages is an indicator of the fertility of the race. It is possible by calculating the net reproduction rate to find whether the population is likely to go on increasing or decreasing in the future; while the calculation of the excess of births over deaths gives a rough and ready indicator of the present population growth, a factor of great economic importance. In countries with a widespread medical service, proper diagnosis and a complete system of medical certification of death, an analysis of the causes of death is one of the most important of all the medical statistics. From many other aspects, including the legal and political, proper civil registration is of the greatest importance.

Present Situation

1. At first sight it would seem from the layout of the Department given in the preceding section of this report that two sections of the Census and Civil Registration organization dealt with mortality statistics, namely, the department described as Nufus

and the department described under the title of Civil Registration. In actual fact only the former is concerned with civil registration in the statistical sense and the latter therefore may be briefly dealt with first. This is in fact an administrative—legal office. It is chiefly concerned with changes in civil state and their record in accordance with the laws of registration, and with the problems arising therefrom in the provinces. There are several sub-sections which deal respectively with the issue of conscription lists annually to the military authorities (apparently done mainly from provincial lists as the main registration office has not complete records for all the provinces); legal changes of name; settlement of legal disputes and differences; court matters; renewal of birth certificates; and records of Iranians resident abroad. It might be thought that this last section, which deals also with naturalization, might be a source for emigration and immigration statistics, but in fact these are held by the police.

It is not desired here to make recommendations beyond the following:

a. A change in its name to something which is not readily confused with the function of the true civil registration system, namely, Nufus.

b. Later examination by the Central Statistical Bureau of the statistics on foreign resident Iranians to eliminate any duplication of the police records and to insure their utilization in the maintenance of *de jure* figures.

2. The system of civil registration proper is best considered from its origins upwards and for this reason visits were paid to a number of provincial registration offices. While there is a law that children should be registered within ten days of birth, and presumably similar legislation in regard to deaths, formal registration by departmental officials begins with the local traveling registrar at dehistan or bakhsh level. It is the function of these officials to tour usually on a three-monthly basis in the area allotted to them and to register officially the record of the birth or death which has already been made by the village head man. In cities where offices exist registration is, of course, more immediate. Municipal or private doctors send the report of death to the office and births can also be registered direct. In the villages the head man records deaths, and it is the responsibility of the parent to record births with him also, penalties being set by law for failure to register. Owing to the need for the birth certificate in various fields, birth registration is probably more complete than that of deaths. The initial registration of births and deaths by the registrar is in all cases the same, and is made in duplicate in small books holding only about 10 registrations each. A separate pair of books is kept for the two types of occurrence. The registrar makes out a small form which may be conveniently described as a declaration. If both father and mother in the case of birth are registered in the same area, one copy only is made. If on the other hand the parents were born in two different areas two copies are written.

There are about a thousand such registrars in the country above whom there are 107 provincial offices at shahristan or ostan level, the shahristan offices in general being under the control of the ostan office. To these offices the declaration forms are sent regularly and from them the existing registers which purport to cover the population of the country are amended. If both father and mother were born in the ostan or shahristan concerned (in the case of birth) the headquarters office amends both entries in its own register, and then passes the declaration form to Tehran so that the father's and mother's entries can be amended in the main Nufus office. If on the other hand either the father or the mother was born in a different district, the declaration forms will have been received as explained above in duplicate, and the only entry which can be amended is, of course,

that of the parent who was born in that ostan. One copy of the declaration is used for this purpose and is then forwarded direct to Tehran, while the other is sent to the ostan in which the other parent was born so that their records can be amended; it is then passed on to Tehran. At the end of the year the registrar sends to the headquarters office the two small duplicate books in which he made his original entries, and it is not until then that the child is treated as a separate entity and shown as a new entry in the main register as distinct from the father's and mother's entries. The register containing the new entries is itself made in duplicate and one copy goes to Tehran.

The process in the case of deaths is similar, except that, of course, only one copy of the declaration comes to the headquarters office, which is used to amend the register; if the person was born in a different ostan, the form is passed on to that ostan to amend their records and thereafter to Tehran.

In the case of marriages and divorces, information may be obtained either from the religious courts or from notaries; and from this information the registrar prepares a copy of the declaration form and sends it together with a summary list to the headquarters office, which amends its registers and then passes the form to Tehran for the same purpose. If either the husband or the wife or both were born in ostans other than the one concerned, two copies of the declaration come up which are passed to Tehran through the appropriate ostans for the amendment of their registers.

There is certainly a considerable number of people in the country who escaped the original basic registration in 1297 to 1304 (1918-1925), or who have been born since but not registered. To cope with this a system has been devised whereby the registrar finding such persons sends up a special declaration in duplicate, which is copied into a particular register at the headquarters office, of which one copy remains there and the other is passed to Tehran. It may be added that where an original declaration form does exist the birth, death, marriage, and so forth, is recorded thereon as well as in the registers. New declarations on the lines of the original 1297 registration are not made out for new-born children, the duplicate book which comes up from the registrar being regarded as taking their place.

In addition to this somewhat complex registration system, a monthly analyzed return is sent by the registrar through the headquarters office to Tehran.

The Nufus section of the head office in Tehran is the recipient of all these declaration forms and of the annual copy of new registers. The result is, of course, that registers are arranged by year of registration and locality. It is not claimed that they are complete, since only some 10,000,000 persons have been registered, although the figures are more realistic for towns. The section consists (apart from the Tehran local office) of about 30 persons. There appears to be a certain degree of congestion of incoming declarations which, after being sorted by the secretariat, are filed to await the capacity of the registration clerks.

3. In addition to the above Nufus records, the Statistical Section of the Census organization receives the following mortality returns:

a. The monthly summary analysis of the registrations.

b. A monthly return from clinics (where such exist) showing causes of death, split by age groups. These appear to be based to some extent on the issue of certificates for burial.

c. When the Census Department was visited a third return was apparently being received quarterly, listing by name births and deaths with ages as a source for a mortality summary. There was a good deal of obscurity

about the rendition of this as the provincial office at Isfahan declared they did not render it; and it is probable that the rendering of the form is incomplete.

Recommendations

It is clear, for the many reasons outlined in the first paragraphs of this section and having regard to the present condition of civil registration, that the system requires to be simplified, pulled together and its coverage made complete. The following recommendations are made for achieving a complete national registration followed by a good system for the production of all current figures thereafter.

1. A commission should be set up consisting of the Director-General of the Department, the Director of the Central Statistical Bureau, and a suitable specialist from the Ministry of Health, to study the present methods of civil registration with a view to their simplification and the establishment of a new and less cumbersome system. While it is this commission which will make the final decision on the new system and put it into effect through the instructions of the Director-General, the members themselves will be too senior to make the long and detailed investigations necessary, and a working party should therefore be set up under it consisting of one member of the Central Statistical Bureau, one member of the Civil Registration staff, and the foreign adviser to the Census. This working party over a period of one or two months will study the methods in detail both in Tehran and in the provinces for the benefit of the commission.

In making this study consideration should be given to certain elements of duplication which appear in the present system. It is not clear, for example, why two copies of the small registration book are required at the end of the year as well as the declaration forms earlier (though, of course, double copies of the main registers are unquestionably necessary in case of fire, or other loss). It should be considered by the commission whether, for example, the whole system cannot be simplified by having the registrar fill in four copies using good carbons in the case of every type of registration—for which he should be provided with a special pen—so that one copy can be retained by the registrar and three be passed to the ostan or shahristan headquarters. The ostan will retain one for its file and completion of the register, and will send the other two to Tehran, through other ostans if necessary as in the present system. The ostan file copy remains to serve the double purpose of being the original declaration and a safeguard in case of loss of the other copy in transit. There should be a very exact system of receipts and acknowledgments between the ostans and Tehran. Dispatch of the forms should be carefully controlled by a register.

Another consideration which the commission must bear in mind is the increase of the number of registrars. There are, according to the information given, about 1,000 of these and if there are 15 million people in the country this gives a proportion of 1 to 15,000, which is not adequate, particularly in view of the large distances to be covered and the illiteracy factor. It is suggested that a large number of part-time paid registrars might be added, such as local teachers.

Another point to be borne in mind by the commission is that the system does not produce a coherent result. For example, people tend to be grouped in registers by the manner of registration, that is, by date, rather than in any other way. Moreover, since children are not given an individual entry in registers until the declaration book comes up at the end of the year, any attempt to gauge infant mortality is doomed from the start, especially since it seems likely that children who die before they reach the age of ten days

(and probably some of those dying above this age) escape registration either as a birth or a death. It does not require a very profound knowledge of statistics to see that this is not a self-compensating error if we wish to set infantile deaths against 1,000 live births.

Finally, the commission must bear in mind that the eventual aim is not merely to produce total figures of mortality but to produce many special rates, such as infant mortality rates, incidence of death by causes, and interim estimates. The latter are of particular importance, for by them all departments of the Government may be kept informed of the real state of the population at any time. These can be made by adding recorded births to and subtracting recorded deaths from the census figure, taking into account, if possible, emigrants and immigrants in regard to the country as a whole or a particular area. If two census figures are available, separated by the usual period of ten years, it is simple to calculate the average annual increase and project the later figure forward. If we have ascertained a rate of increase we can use the so-called geometric method.

2. It is strongly recommended that following the activities of the above commission but in advance of the first census the Civil Registration organization be laid out in conformity with the exact administrative areas of the country. A suggested date for this might be No Ruz of 1329. Such a reorganization might create havoc were the present registration system adequate; but since it is not, a revised layout will provide a good framework both for the new complete registration recommended in 3 below and for the census itself. At the same time a drastic improvement must be made in the quality of the Civil Registration personnel, who generally in the provinces are below the standard of most of the Government officials, and need to be stimulated into appreciating the vital (in every sense) importance of their job.

3. There is no point in taking a census at all unless the registration of the population is complete from the moment it stops, both in regard to what we might call the capital account, that is, the registration of everyone living in the country at the time of the census, and in regard to the current account, that is, the births and deaths thereafter. On the basis of the census, therefore, every person in the country must be issued with a new identity card which for some time thereafter will be rigorously demanded as a prerequisite for all sorts of purposes, such as pensions, ration registration, police checks, and so on. This will encourage persons omitted to come forward spontaneously.

It may be asked why we should link the large task of issuing new identity cards, and hence re-registering the entire population, with the equally large task of taking the census, but the following points must be borne in mind:

The census gives us a complete coverage at one moment of time

If registration is completed long after this there will have been changes

There is a special extra staff temporarily on the spot for the census

There may be enormous extra work if registration takes place long after the census, with consequent checking and queries.

It is suggested as a working system (though tentatively and subject to the specialist opinion of the census adviser) that the census form, see Exhibit P-2, of which there will be one for each individual, should in fact be completed in triplicate and be issued to the enumerators in pads, either with the three forms side by side or printed on sheets of three different colors bound under each other in the pad (this is to-day a simple stationery operation). Forms will be numbered serially, but each of the three forms used for one individual

will bear the same number. It should be possible so to arrange the number that they automatically show the ostan, shahristan and bakhsh in which the individual lives, while the last few figures are the personal serial number. Thus 01 07 48 4293 would indicate an individual who lives in ostan 1, shahristan 7, sub-division 48, and whose personal number in that division is 4293. If the triplicate forms be lettered A., B. and C., A. will be the census form proper and will contain more particulars than the other two, while B. and C. will be used by Tehran and the ostan respectively for registration purposes and will carry identical particulars. On the backs of B. and C. will be spaces for photograph and thumb print and any written information unnecessary for the census but necessary for registration, for example, the family name. There will also be a space for an office stamp on the front.

Utilizing this form, the enumerators and supervisors will, after sending up their primary count from the envelope or other census summaries, copy the information from A. to B. and C. as far as is necessary (unless carbons have been used) and then tear off copy A. which will go to Tehran as the census form. Large packs of identity cards, already prepared except for personal details and with serial numbers printed on exactly as on the forms, will be held at the various headquarters of the Census organization, and in the few months at most following the census the supervisors will return to the houses and issue the identity cards, stamping the forms B. and C. to indicate issue and adding the thumb print of the individual and if necessary his photograph. They will then tear off the forms B., and send these in groups with a careful system of acknowledgment and registration to the Civil Registration Department at Tehran. Copy C. will remain in the ostan and will be used to amend the registers and as a permanent record. Any deaths in the short period immediately after the census will be so marked on the form, and a system will have to be devised to deal with any movements of a permanent nature. Between the date of the Census and the completion of the issue of these identity cards, reports of births, deaths, marriages and divorces will be held in a special file and not registered. The Tehran office will use copy B. to make its new registers, possibly using the old registers as a basis; but it is a point for consideration whether the production of these cannot be facilitated by running off lists (which would be linked to the form B. by the serial number) from the punched cards made for census purposes from form A.

4. It is recommended that all statistical returns on mortality be handled as at present by the Statistical Section, which will be, in fact, in accordance with earlier recommendations, a distinct section of the whole Civil Registration Department. These returns will, however, reach the Statistical Section through the Nufus Section (or, as it is proposed it should be called, the Civil Registration Section). This will prevent duplication and allow the Nufus Section to check at once the returns and the individual reports of mortality which it receives.

It is further recommended in regard to the mortality returns that the quarterly sheets giving births and deaths by name should be cancelled, if in fact the receipt is regular and not merely fortuitous. The return received from clinics showing the causes of death should be consolidated up to date, and consideration should be given by the commission recommended above to the introduction of a proper system of registering causes of death by the registrars. This, however, may not be practicable until the medical services are more widely extended. Some basis, however, exists in the certificates made out by municipal physicians attached to cemeteries or by private doctors. Any system must base its classification of causes on the International Standard List of the

Causes of Death, using broad heads where diagnosis is doubtful. The exact date of birth (when known) should be shown on the death declaration.

5. When the new registration is fully established it should be a simple matter to institute the punching of cards for all reported deaths and births. This would allow particularly a more detailed analysis of the causes of death, and of ages, and so forth. It is a matter for future decision whether a small machine installation should be retained by the Census and Civil Registration Department for this purpose (while the main Census installation is there it can carry the work), or whether the job should be done by the pool of machines of the Central Statistical Bureau. Cards might show for deaths: month, year, place, registration number (for the registration); month, year and place (for the occurrence); hospital, if relevant; place of residence; sex; marital status; age; nationality; religion; place of birth; occupation; number of children; cause of death and, if possible, duration of illness. For births the cards might show the same details of registration and occurrence; hospital and place of residence; sex of child with special punching for twins, and so forth; particulars of the father, for example, age, nationality, religion, birth place, occupation; similar particulars of the mother, including age at marriage, and duration of marriage; other children. Figures in any case must be supplied regularly to the Central Statistical Bureau.

Note:

No request was made for an examination of the statistics of emigration and immigration, which exist in the Police Department. These are important, and at a later date an official from the Central Statistical Bureau should examine the records to ascertain whether they require reorganization. The figures should in any case be made available regularly to the Bureau. If large numbers of people enter and leave Iran the punched card machine pool of the Central Statistical Bureau can handle the work. Cards should be devised on the lines of those formerly used in Palestine which show the month, year, place of entry, reference number, class of entry, route, religion, sex, marital condition, age, occupation, reason for entry, period, and the entrant's country of birth, citizenship, residence and destination. Such a system would undoubtedly facilitate not only detailed analysis but checking up on records and individuals. Names would not be recorded but only the reference number given to the person.

Attention is directed to the study on Statistics of Migration published by the International Labor Office in 1932 in their series of Studies and Reports on Statistics. Here will be found a discussion of definitions, various international difficulties and suggested systems.

Budget

The cost of printing involved in any plan of the nature suggested above should be covered from the publication and printing allocation in the special Census budget in the previous section. The operation of registration, if carried out simultaneously with the Census, should be included in the Census cost and is therefore also covered by the above budget. An expansion of the Civil Registration organization will require a special raising of the present revenue allocated to the department in the normal Governmental budget.

Public Health

It is a well-known fact that there is a great deal of disease in Iran and that some major diseases, for example, malaria, trachoma, smallpox and the venereal and intestinal diseases, are very common. The greatest cause of disablement and loss of manpower is

probably the first of these. It is therefore fitting that in the economic development projects of the Seven Year Plan, public health measures should play an important part. Yet the assessment of which diseases are the more economically crippling, the study of their causes, and consequently the design of a public health program, are all seriously handicapped by the lack of statistics in this field. Diagnoses are not uniform; figures are incomplete for the country as a whole and often inexact within their limited coverage; and neither population census figures nor mortality data are of such a nature that the morbidity statistics can be set against them to calculate the incidence of disease or fatality rates. Every effort must therefore be made as an integral part of the Health Program to build up an organization to handle public health statistics and to train medical statisticians, to secure uniformity or nomenclature in diagnosis and to make complete the records within those fields where completeness can be achieved.

Present Situation

The medical data at present existing for Iran can scarcely be described as quantitive since the 11,000,000 to 12,000,000 persons in villages have virtually no medical service; and there is no way of ascertaining whether the health situation among those not cared for is exactly the same as among those receiving care. Altogether it is estimated that diseases are reported for only about 25 per cent of the population, this being at maximum the proportion which comes under the care of the clinics operated by the Ministry of Health or which passes through the established hospitals.

The principal statistics collected specifically for public health purposes are, of course, concentrated as they should be in the Ministry of Health, in a Statistical Department which forms one of the Departments of the technical side of the Ministry. This Department has been in existence for some six years and consists at the moment of a half dozen clerks under a head of the Department. The work appears to be carried out conscientiously, and two merits of the Department are careful and exact recording of the figures submitted and recognition of the deficiencies of their material. The chief work is as follows:

1. An organization chart is maintained.
2. Infectious disease reports are received by telegraph weekly from the health officials only—in all from about 350 stations. These show reported cases and deaths for a list of infectious diseases, but do not include the dysenteries, though these were previously reported. Physicians in private practice do not normally report these diseases although in fact they are obligated to do so by law. The data in the main refer to cities and the larger towns possessing health stations.

In the Statistical Department the telegrams are first recorded on a check list (negative telegrams must be sent), are entered into a register in order of receipt, and then recopied in another register in order of ostans. The reason given for this double entry is that there are so many negatives that if all names were written in beforehand in one register in ostan order and the telegrams thereafter recorded in succeeding columns, there would be a great waste of labor and many more books would be required. Only some 80 of the 350 telegrams, it was stated, are on the average positive (this seems to show poor diagnosis and local reporting, for some of the diseases must certainly be more widespread). Another reason given was that the weeks' returns tend to overlap, one week beginning to come in before the previous one is complete. From this second register a third copy is made for counter-signature by the head of the Department and the data are then forwarded by mail to the World Health Organization.

About 80 copies in all are sent out in Farsi and French to various countries and branches of the Ministry. A more final form of the return is made out at the end of the month and there is an annual summary.

3. In addition to the above the Ministry of Health receives a monthly medical report from the Medical Officers (but not private physicians) who include figures for medical institutions in their area. Thus, the Church Missionary Society hospital at Isfahan renders figures to the local medical officers so that separate hospital figures do not exist (except for Tehran—see below).

   The return is in the form of a small book covering the number of cases known to the medical officer for his area for 111 diseases. The list includes 42 infectious diseases and is divided into 18 groups. Ignorant doctors often put diseases under "Comments" which should really be under a head, and the list itself is open to criticism; for example, it does not conform to the International List, does not separate primary from secondary malaria and does not distinguish bacillary from amoebic dysentery. (It is possible that provinces have not the equipment to make the necessary distinctions in such cases, and certainly emetin is employed very widely for the dysenteries). Other figures cover mortality statistics which really emanate from the local Registrars, though they may also derive from the municipal physician who is attached to the cemeteries in the large cities. It would seem that he has often to guess at the cause of death. The birth figures are subject to the same criticism as those made in the preceding section of this report. (It should be noted that more general data on mortality are supplied from time to time by the Civil Registration Department to the Ministry.) The booklets also show details of the health organization in the area, such as, number of doctors, hospitals, beds, pharmacists, vaccinators, and so on.

   These returns, like the communicable disease reports, are handled in a rather cumbersome fashion. They are first checked off on a completely separate check list from that for infectious disease return, and defaulters are pursued by letter one month after the date on which the return is supposed to close. The details are then entered for each of the diseases, men and women separately, cases in black and deaths in red, in large registers with a page for each one of the rendering units. There are totals for the year and columns for vaccination, births and deaths. The two latter appear unnecessary and it is thought are never checked with the Civil Registration records. The miscellaneous information is entered in another register which is well arranged. Totals are transferred to a book divided by ostans, and a consolidation sheet is used for the whole country.

4. The Department is also engaged in registering all doctors, pharmacists and hospitals. This is not strictly part of the statistical work but is relevant thereto.

5. The Department is concerned with hospital statistics for Tehran only. It was stated that each of the hospitals sent a daily bed statement showing the number of beds, those occupied, out-patients, patients died, discharged and entered. There was no return of diagnosed hospital cases at the date when the Department was inspected.

6. The Department also maintains a number of graphs and charts and produces an annual report from all the above.

In addition to the above statistics maintained in the Ministry of Health good medical records exist in the Insurance Company of Iran for a large number of workers insured with that Company. These are discussed below.

Recommendations

The small Statistical Department in the Ministry of Health is undoubtedly careful and recognizes the deficiencies of its material. No claim was made that the statistics are complete for Iran but only that they show a careful analysis of cases reported. But if we consider the situation in general it is clear that the morbidity statistics of Iran require drastic improvement, partly since they are not complete in their coverage, partly since diagnosis is unreliable, and partly since there are no adequate population statistics or mortality records against which morbidity can be set. It will take a long time before an extensive system of medical statistics can be built up in the country, though this is eventually an essential weapon in the campaign of public health. As steps towards this, recommendations are made for detailed improvements, mainly in technique, in the present work of the Ministry of Health Statistical Department, general lines of development and recommendations affecting other Departments.

The Statistical Department of the Ministry of Health

1. A new system of checking and maintaining records of renderers should be initiated on the following lines:

   a. Every Medical Officer should be allocated a number, these numbers being such that by sorting returns in numerical order we automatically sort by shahristans and ostans. The system should be adaptable so that hospitals, clinics, and so on, can also be numbered without disturbing either the ostan or the Medical Officer order. Thus the first two figures will indicate the ostan, the next two the shahristan, the next the type of renderer, such as, Medical Officer, hospital, and so on, and the next the serial number of the renderer within the shahristan. So we might have 01/01/1/2 which would stand for ostan 1/ shahristan 1/ Medical Officer / Medical Officer Number 2.

   b. A visual card index should be maintained of the Roneodex or Kardex type with the cards arranged in numerical and hence ostan/shahristan order. Hospital cards should be of a different color inserted after the appropriate Medical Officer's card. All Medical Officers will write their numbers on the monthly return; on the infectious disease report this can be omitted to save telegraphic cost.

   c. This index should be utilized as the master checking index for all returns received by the Department, and each of these as it comes in will be checked against the cards and a colored signal inserted to show receipt or negative, blank spaces representing non-renderers. Returns will then be sorted in numerical order in the case of the telegraphic communicable disease reports, the number being put on from the cards; in the case of the monthly returns the number will already be on.

   The use of this system should result in much more control over the rendition of returns and will facilitate the introduction of new returns or the extension of the rendering list. It will also eliminate the existing check-lists and reduce the amount of paper work. The equipment required will be a Roneodex or Kardex cabinet with some 20-30 trays and about 1,000 cards, of which a quarter should be colored. Six boxes of differently colored celluloid signals should be ordered and enough celluloid strips for the bottom of the 1,000 cards. The designing of the card prior to printing (which should be done locally) should be carried out in conjunction with the Central Statistical Bureau; but it is suggested that it may in the main resemble Exhibit P-3.

2. The system of handling the communicable disease report is not good, for not only duplication but triplication of work exists and the checking is not necessarily complete. It is recommended that the telegraphic returns be checked on receipt with the proposed visual card index, the number being put on the telegrams which will then be sorted in numerical order, and that from these sorted returns one sheet only will be prepared on the 10th day. This will eliminate the need for the check list and both registers.

   After one month when amendments are received the finalized return will be produced from the 10-day sheets with corrections, amendments having been kept in a loose file after checking. Finalized data will then be copied on to appropriate columns on the front of the visual cards, including the amendments, so that a running record is maintained. Thus a record would exist of variations in each Medical Officer's area week by week. These records can be consolidated quarterly and annually so that data are available for these periods by area and Medical Officer. Individual cards will be watched by the head of the Department and danger spots can be flagged.

   At the same time efforts should be made to obtain reports on infectious diseases from private physicians; it is very unlikely that this can be done by disciplinary action and rigid application of the law; instead the medical profession should be encouraged to co-operate to give prompt and adequate reports.

3. The monthly return is handled on a system which, though cumbersome, seems to be carefully and accurately employed. Since the extensive registers are already printed the system should probably not be changed for the moment. The number of Medical Officers is too small for punched cards, the number of diseases too large for a visual card index or Paramount cards. It is true that there are about 350 x 111 units of disease information, and once a punched card pool exists, the consolidation might be tried out on this for diseases only. (It would certainly be rapid to gang punch disease numbers, month, death or case, Medical Officer and ostan number, and then pluck appropriate cards from these pre-punched files, afterwards counting on a sorter-counter.) At the moment, however, the register system should continue and certain major information should be extracted and inserted on the back of the visual card. The check-list should be abandoned and check made against the visual index, and it is important that the list of diseases be revised as soon as possible and the standard International List be adopted. A small adding machine of the Plus Adder type should be purchased.

4. The registration of doctors, etc., should be transferred to the visual card index.

5. The Tehran hospital return should be made complete, that is, all Tehran hospitals should be informed that they must render returns or they will incur the displeasure of the Ministry. The Medical Officers in Tehran should exclude hospitals from their monthly return (as in fact they are supposed to do), and two returns should be rendered—a self-checking daily bed statement and a monthly diagnosis return similar to the Medical Officers' monthly returns. These returns should be consolidated in registers and the daily return should be added and sent to appropriate officials in the Ministry.

   This system should gradually be extended to the provinces where, however, a daily bed statement would be sent only to the local Medical Officer. The monthly hospital figures will be appended to his monthly return but not included in it, and will be forwarded to Tehran.

6. It is recommended that the Department produce graphs by ostan and that it abandon the use of "pie" or circular charts for time series for which they are not adapted.
7. A qualified doctor in a country where these are in short supply should not be occupied with the administrative control of the Statistical Department. A suitable layman can be trained under the biological statistician recommended below.
8. The Statistical Department should be given much more space than it had when visited (namely, 2 rooms). It cannot be overemphasized that statistics can not be produced in huddled, overcrowded conditions.

General Lines of Development

1. Private agencies should be encouraged to accumulate good health data in their own localities.
2. An adequately-trained biological statistician, who must at first be a foreigner, should be appointed to the Ministry of Health and should be responsible for research in medical statistics. He will have a supervisory control over the statistical section. At the same time certain top personnel should be properly trained in bio-statistics, this being a charge which will fall against the health program either through fellowships or its own funds. The problem of bio-statistics is referred to in the health section of this report (Vol. II).
3. Each hospital should have a statistical or administrative clerk or registrar and these should have in-service training through the Ministry of Health organization. At the same time public health workers, including medical officers, should all be given a certain degree of training in medical statistics.
4. From the beginning of the health program continuous records should be kept (in the Ministry of Health and provided to its statistical section) of the actual progress of the plan, for example, of D.D.T. spraying. These will be administrative and progressing figures.
5. From the opening of any new health center or hospital it will be brought completely into the statistical system.
6. It is not possible at the moment to make the health statistics of the country extensive, but intensive surveys may be made of certain chosen areas and these should be controlled by the bio-statistician.

Recommendations Affecting other Departments

1. The health records of the Insurance Company of Iran should be properly analyzed, as suggested in the section of this report dealing with social insurance, and the analyses will be provided to the Ministry of Health, the Ministry of Labor and the Central Statistical Bureau.
2. A course on bio-statistics given by the foreign specialist should be included in the University medical course.
3. In drawing up a population census form special attention must be paid to obtaining useful health information; and in any case age distribution, family size and so on, which will be automatically derived from the census, are of importance to the Ministry of Health and should be given to it through the Central Statistical Bureau.
4. All the Ministry of Health's information should be made freely available to the Central Statistical Bureau.

Budget

It is difficult to estimate at the present stage the cost of improving health statistics in the manner suggested above. The following specific items can be indicated:

1. A small allocation of about Rls. 20,000 in the first year of the Plan for the purchase of the necessary equipment by the Ministry's Statistical Department.
2. An allocation from the second year of the Plan onwards for the foreign bio-statistician which will probably be about $10,000 per annum with some expenses in Rials.
3. An annual addition to the revenue allocated to the Ministry of Health Statistical Department for the printing of forms, travel, training of clerks and expansion of its work, which is extremely difficult to estimate but might be about Rls. 1,000,000 per annum.
4. An allocation in the later stages of the Plan for the intensive statistical health surveys. This will have to be considerable but cannot be estimated until the surveys have been laid out by the bio-statistician.
5. The costs of training Iranians in bio-statistics, which again cannot be specifically stated at this stage.

All the above will be borne by the health budget of the Plan.

SOCIAL

General

Social Services and Internal Administration

Many aspects of the national life can be grouped under the title, "Social Services", but after careful consideration it has been decided that what are usually known as public utilities should be dealt with in this report under the headings with which they are functionally connected; and therefore statistics of drinking water are included with those of water resources generally, while those of electric power have been transferred to a special section under the main head, "Production". We are limiting the discussion, immediately following, to those subjects which are more purely and obviously of social significance, for example, education, labor and the like. Under the above heading we will consider only three fields, namely:

1. Statistics concerned mainly with the administrative framework of the country;
2. Statistics on housing, and
3. Those leading towards a scheme of social insurance.

Administration of the Ministry of the Interior and Municipal Organization

Present Position

In addition to the large statistical organization of Census and Civil Registration there is in the Ministry of the Interior an Information and Statistical Section which is concerned mainly with the dissemination of information and with administrative functions in connection with conscription, registration of changes of name, and the like. It does, however, have a geographical office which maintains population figures on villages derived from the census, the administrative layout of the country and certain other statistical data. There is also the Municipalities Department, which is mainly concerned with financial and tech-

nical control of these bodies. It therefore possesses full budget figures for the municipalities and files on electrical supply, construction, and so on. This information appears mainly to lie in these files in the form of raw material rather than as organized statistics.

Recommendations

It is considered that in so far as the functions of these two sections are statistical, their work might well be transferred to a Municipalities Section of the Census. However, statistics of electric power produced by municipalities will, it is recommended elsewhere, be a matter for the statistical section of the Ministry of National Economy. It is recommended, therefore, that the records of these two departments (Municipalities and Information) be investigated soon by a commission consisting of the head of the Information and Statistical Section of the Ministry of the Interior, a representative of the Municipalities Department, the Director-General of Census, and a representative of the Central Statistical Bureau, to discuss how far these records can be handed over to a sub-section of the Census. Such a section would keep records of administrative layout, municipal buildings, and so forth, and obtain any necessary information on water supplies and electricity from the appropriate authorities through the Central Statistical Bureau. It is relevant to remark that at one time the Bank Melli took a survey of the country from which basic records might yet be extracted.

Budget

This is a matter for decision by the commission.

Housing

As explained in the housing section of this report, it is necessary for the Seven Year Plan to include housing development. The cost of houses has risen very sharply in the last few years, partly owing to a rise in building costs, which is to some extent reflected in the Wholesale Price Index, and partly owing to the fact that the standard of housing has arisen, which has naturally increased costs. Wage levels have not gone up in proportion to the rise in building costs and rents, and the Cost-of-Living Index shows a more serious rise in rents than in other fields. By such statistical instruments we can assess to a certain extent the need for housing; but housing statistics as such may scarcely be said to exist. Hence it is impossible in the present section to discuss any existing statistics, and we may therefore proceed direct to such recommendations as can be made.

Recommendations

Statistics in connection with housing may be divided into (1) general statistics which reflect some other aspect of the national life and which are dealt with in other sections of this report, but in the compilation of which it is necessary to keep in mind the statistical needs of a housing plan; and (2) the particular statistics of actual housing and housing conditions.

1. The most important general statistics required are those of populations and it is essential that, after the taking of the population census, figures for the principal towns showing the number of persons in each house should be provided as early as possible to any housing authority which may be set up. A second need from the population census is the density of population in each area, and a third need is an analysis of the population by occupations.

It is also important for the assessment of housing needs that the statistics of the movement of population to and from towns should be collected, and it is therefore recommended that these should be provided through the Central Statistical Bureau to any housing authority which is set up. These movements of population statistics may in time be available from the Civil Registration Department, but at the moment it is thought that the Police Department may be the only source.

It is further recommended that when the new family budget study is made for the revised Cost-of-Living Index which is proposed below, special attention be paid to the rent element, and that these figures be later supplied in detail through the Central Statistical Bureau to any housing authority.

Finally, it will be necessary for any housing authority to know the availability of labor in the building trades, its location, wage rates and if possible mobility. It has therefore been recommended under the labor section of this report that a special study be made of building labor in the country by the Ministry of Labor early in the Plan period. These also are figures which the housing authority will require.

The above four types of statistics, that is, on population, on movement of population, on rents and the cost-of-living, and on building labor, are not the only related figures which should be supplied to a housing authority; but they are the most important in that they are the four types of statistics in the compilation of which some special attention must be given to the question of the housing authority's needs. Such an authority will, however, require to obtain from the Central Statistical Bureau a number of its other statistics of social significance, such as on health, crime and the like.

2. In the housing section of this report a Central Housing Authority is recommended as part of the Plan Organization. One of the duties of this Authority, it is stated, will be to collect statistics and data on the present housing conditions, the type of houses required and the demand, and to interpret the population statistics received from the Civil Registration organization in terms of housing requirements. It is desired to endorse this recommendation here and to point out that at least the following statistics will be required:

   a. The number of houses in each town divided by districts and streets, which will be obtained initially from the population census.

   b. Sample studies of houses with regard to their types, the number of rooms in each house, and the grade of house. This can probably be done by taking certain areas and making a survey of these, using the census control sheets as a base.

   c. Exact statistics on all new building undertaken.

It is recommended that a recent publication of the International Labor Office, Housing and Employment, 1948, be carefully studied. This is No. 8 of the new series of International Labor Office studies and reports.

Budget

The sum of Rls. 10,000,000 has been budgeted to be spent on housing and in particular on the preparation of plans in the first year of the Seven Year Plan. It is considered that the compilation of housing statistics, except in so far as these fall against the normal

cost of the Census, should come out of that part of this sum which is allocated to the formation of a Department of Research. The running costs of this department will be met from the sums allocated for housing in the remaining years of the Plan.

Social Insurance

There is at present no complete social insurance plan in Iran, nor is one contemplated as part of the economic Seven Year Plan itself, though it may be developed parallel thereto. A number of steps have, however, already been taken in this field, commencing with the establishment of a compensation fund for the workers engaged in building the railway in the year 1310 (1931). In 1315 (1936) this insurance, which related only to accidents, was extended to all factories and to include diseases. About 1318 (1939) some of the factories transferred the burden to the Iran Insurance Company by means of separate agreements, financing the fund by a contribution of 2 per cent of the wages which was at that time paid by the employees. In 1322 (1943) a proper compensation law was passed covering in effect certain factories only, and in 1325 (1946) this was widened in its application to cover all institutions employing workers throughout the country. This covers all diseases and accidents arising out of work. A slightly different payment was fixed of which one-third is payable by the worker and two-thirds by the employer, and the risk is normally accepted by the Insurance Company.

In the Labor Law now under discussion, Article 17 in the draft deals with social Insurance, and together with Article 20 envisages the presentation to the Majless of a social security law guaranteeing to the workers health benefits and a subsistence payment, in the case not only of illness and invalidity or disability resulting from the employment, but also ordinary sickness, maternity, and invalidity, together with old age benefits and a benefit to the family on the death of the breadwinner. The system envisaged for provision of these benefits is that of a flat rate charge of 3 per cent on the wages in the proportion of one-third payable by the worker and two-thirds by the employer. These monies will accrue to factory, regional and national compensation funds in varying proportions, and to the Industrial Accident and Diseases Section of the Insurance Company which it is proposed should be detached and operated as a non-profit-making concern. This last will be responsible for the sickness and accident benefits arising out of employment, and the other social insurance benefits will, it is proposed, come from the system of factory and other funds.

This is an ambitious scheme, the chief difficulty in applying which is the lack of statistics or mortality tables. It was the opinion of Professor Feraud, who visited Iran with the International Labor Office delegation early in 1327 (1948), that the scheme might have to be limited at the outset to industrial accident and disease, sickness and maternity. On his visit he pointed out that there were no figures to back any calculations on such risks as unemployment benefit, and that the mechanics of the social insurance function of the Insurance Company must be maintained, if and when it becomes a separate fund, since here there is the only real material for calculation and the only element of mathematical technique and actuarial science.

Complete separation from the Insurance Company was apparently not in M. Feraud's mind, since he advocated that the Company's offices in the provinces have the dual function of operating commercial insurance for profit and social insurance on a non-profit basis. It is understood that a proposal has recently been made that the whole of the social insurance function come under the executive control of the Ministry of Labor. This appears to the present writer to be a retrogressive step and not in accordance with M. Feraud's

ideas as he understands them. If a social insurance scheme is to be extended in Iran, there must be very careful advance calculation of the risks involved and the funds and contributions necessary, and the material already accumulated by the Iran Insurance Company is the only firm basis on which to work. It is therefore desirable to discuss in the paragraphs below something of the statistics already maintained by this Company.

Present Situation

While there are statistics within the Company in connection with its commercial operations, those with which we are concerned lie under the technical administration in the Workers' Insurance division. It is compulsory for industrial companies to insure for industrial diseases and accidents with the Insurance Company though compliance may not be universal; and at the date of examination of the records about 140,000 workers were insured, of whom 60,000 were in Khuzistan, 16,000 in Isfahan and 19,000 in Mazandaran. The anticipated target when the 1325 (1946) regulations are fully implemented is about 250,000. For industrial accidents the Company maintains statistics showing the number of workers insured during the quarter, the number of accidents, the number on which an indemnity was paid, the number of persons temporarily or permanently incapacitated, and the number of deaths. These figures provide fairly adequate records of the incidence of industrial accidents. Some statistics on industrial diseases are also being extracted.

The great merit, however, of the statistical work being done by the Insurance Company lies in its medical records, which are gradually being compiled after medical inspection of each worker. An elaborate form is filled in for the worker on the initial examination, which shows diseases from which he has previously suffered, the results of the inspection, a more detailed examination of lungs, a physician's general opinion, and many records of the worker including his occupation, grade, daily wage, number of dependents, how many children have died, family sickness records as far as known, literacy, distance of home from work and general measurements. This is a very complete initial form, from which a card is filled in for each worker showing place of work, employment and daily wages, and having spaces for the record of any accident or illness from which he suffers, the duration and result of treatment, and the indemnity paid. In the case of death, cards are also maintained for wife, children or other dependents. At the time of examination of the Company about 52,000 forms had been completed, but no doubt this has been increased since.

In addition to the records maintained in the head office on these forms, each worker carries an insurance book and a medical book. The former is the normal type of insurance book for recording contributions, and in the latter are recorded payments of disability pensions; there is also a widow's or dependent's book. These are thus an integral part of the records. There are also special forms for reporting actual accidents or illnesses with many valuable details and a visual indicator of the body area affected; these appear to be well designed. Special forms also exist for reporting on factories making an agreement with the Insurance Company and for drawing the attention of the employer to deficiencies in welfare.

Recommendations

These forms in use by the Insurance Company are among the best-designed and most complete found in any field in Iran. The great need now is to make use of them for more than merely administrative purposes. This was clearly fully appreciated by the

officials of the Company who were already, when the visit was made, beginning to make studies using only the limited experience available.

This is not sufficient, however, and the following specific recommendations are made:

1. The Ministry of Labor as described elsewhere is engaged in constructing an employment index. This index should be meticulously checked with the records of the Insurance Company factory by factory.

2. Detailed statistics on the activity of the social insurance work of the Company should be extracted and published. In these the following main heads have been agreed with M. Feraud:

   a. Number of insured workers.

   b. Number of accidents on which indemnity has been paid in the year.

   c. Number of industrial diseases on which indemnity has been paid in the year.

Both b. and c., above, should be sub-divided into deaths and non-fatal cases, and the former should show further the number of cases in which a payment to a widow, to orphans and to other dependents was made; while c. should be divided into temporary incapacity and total or partial permanent incapacity.

   d. There should also be statistics of pensions in issue to dependents.

   e. Medical statistics should be extracted showing for each disease (in accordance with the International Standard Classification) the number of cases, the fatality and the number of days in hospital.

If possible all the above statistics should be separated by provinces.

3. The final aim should be to produce mortality tables, and this can be done only after the taking of the census and the establishment of good birth and death registration over a period of years. In this matter the Ministry of Labor and the Insurance Company should hold discussions just prior to the date of the census with the Civil Registration Department and the Central Statistical Bureau. In the meantime the Hunter semi-tropical or Hunter tropical tables as indicated by M. Feraud should be adopted as a source for actuarial calculation, and from this an attempt should be made to calculate properly the mathematical reserves, that is, the capitalized value of the various pensions and risks. This work should be entrusted to a fully-qualified actuary.

4. In preparation for any scheme for a national social insurance system the appropriate section of the Central Statistical Bureau should ensure that the following statistics are properly designed for this purpose:

   Population: Total figures of population: Occupational distribution of population: Sex: Age distribution: Size of families and number of married workers in industries: Literacy.

   Industries: Grouping of industries whether dangerous, obnoxious, involving risks, of no risk, safe.

   Labor Force: Labor force actually registered: Size of families: Sickness in the labor force: Employment by industries: Wage level: Employment of women in certain industries. (Are any industries run by female labor? Is there more absence among women? What is the effect of maternity?)

Sickness: Incidence in the whole country: Hospitals—Outpatients, Inpatients, Diseases, Duration of Stay: Incidence of Tuberculosis and endemic diseases.

Mortality: Births, deaths and marriages in country generally: Births, deaths and marriages by industries: Infant mortality: Nutrition.

Unemployment: Total statistics split by industries. (Is it seasonal or temporary? Is it in semi-skilled, skilled or unskilled labor? What is the incidence of employment among casual labor, for example, porters?)

Industrial Accidents: Figures by type of industry.

Financial: Retail prices and cost-of-living index: Workers' food basket: Wholesale prices and index: Currency inflation.

It will be noted that all the above figures are dealt with under their own specific headings at various points in this report, and in the above recommendation it is intended only that the Bureau should form a guidance center for such information.

Budget

This work falls within the budget of the Ministry of Labor and of the Insurance Company.

Education

The connection of educational development with the Seven Year Plan is by no means so direct and obvious as in the case, for example, of the rehabilitation of factories or the expansion of agricultural production. It is nevertheless a very real one, for not only is the provision of technical education necessary for the Plan itself, but the raising of the educational standard of the mass of the people and the direction of educational effort into the proper channel are of the greatest importance. Educational statistics may be regarded as being of three kinds—quantitative statistics of the educational machine and its functioning, for example, number of schools, classes, children taught, teachers and equipment; general statistics of the educational status of the entire country, for example, figures of literacy and of the population against which these must be set, which is the background against which education must be planned; and the statistical work involved in educational research, in the analysis of aptitudes and the design of methods. For the success of the Plan all three types of statistics are necessary, for it is essential that the educational machine be properly effective, elementary education (at least) widely spread, and the methods of education suitably devised. An adequate balance must be maintained between the narrow needs of the Plan in industrial and vocational education and the production of skilled specialists, and the broader needs of the country as a whole.

Present Situation

The statistical bureau of the Ministry of Education is under the Office of Information and Statistics, which is part of a department in the Ministry dealing with such diverse subjects as libraries, museums and archaeology. It is doubtful at the outset whether the section is correctly placed, for its work on administrative statistics really brings it under Administration, while any educational research statistics are certainly technical. The section as at present constituted is concerned with quantitative educational statistics and

handles them with considerable care; unfortunately this is a field in which qualitative statistics are also of major interest. There is a tendency here as in many other departments of the Government to regard statistics as a device for checking on the administrative routine of the machine and not for the examination of the work which it is actually performing or for evaluating the lines of policy behind that work.

The bureau distributes annually to all schools in the country a form which shows the type of school, number of classes, type of building, number of books in the library, number of children in each of the three terms, number sitting and passing examinations, staff, and so forth. These forms pass to the education offices which make a preliminary consolidation for schools, pupils and teachers respectively. They then pass these forms to the statistical bureau of the Ministry with a copy of the school form as a supporting document. Another form is received on general matters such as sports and cultural activities. These figures are consolidated by the bureau and were published in 1321 (1942), but it does not appear that they are regularly issued. There are acknowledged deficiencies in the statistics; for example, in 1326 (1947) it was stated that 24 schools in Tehran did not reply. More detailed statistics on examinations are received from the department concerned with these. No attempt is made to work out any ratios or other secondary statistical data.

The remaining statistics of the Ministry are chiefly concerned with personnel, who are classified into (a) administrative and (b) teaching staff. There is a service record in the Personnel Section for every employee, which contains personal identity number and name, qualifications, employment record, and so on. A register is maintained for each class of employee, which seems to contain exactly the same information. The service records are filed in accordance with class and number, and the registers are in the same order. Alphabetical order is as far as possible maintained. There is also, of course, a personal file for each employee. It would seem that there is some duplication in the statistics which are derived by this Section, and those of the statistical bureau.

There is no true costing system in the Ministry, and the initiation of this is complicated by the fact that certain administrative functions are borne by other Ministries; for example, some degree of fiscal control over taxation allocated to education is exercised by the Ministry of Finance. It is very difficult to tell how great is the administrative overhead on education, but clearly it is large. The statistics in general are rigid. There is no trace of statistically standardized tests, nor of testing to ascertain the aptitude level of the pupils before textbooks are designed.

Recommendations

The aims of statistical work in the Ministry of Education should be (1) to improve the administrative machine and in particular its costing, and (2) to provide data for the control of educational method. With these ends in view the following specific recommendations are made:

1. a. The present statistical section of the Ministry of Education should continue as a quantitative administrative statistical section, but should be transferred to the administrative side of the Ministry. It should keep its present statistics, but with this difference, that all the powers of the Ministry will be utilized to make them complete. There should be many minor changes; for example, the library figures should not show the dead figure of the number of books but the live figure of usage; the examination figures should differentiate between those failing for the first time (who stay in the same class), and those failing for the second time (who leave

school). There should be an annual publication of the figures, and the present system whereby schools are to some extent duplicated in the count should be altered.

b. The Statistical Section should not ask for records of the personnel from schools, but forms showing this should instead be sent to the Personnel Section who will pass records to the Statistical Bureau. Within the personnel records there should be a modern system of filing, and a visual card index with a card for each employee which should be numerically linked to the files, with a cross alphabetical index on small cards.

c. The whole aim of these statistics should be to check the administrative and financial efficiency of the system; hence certain ratios should be calculated, for example, number of pupils per teacher, pupils per room, desks per 10 pupils, per-unit cost of instruction (which the Statistical Section should obtain by an analysis of the financial figures), per-unit cost of school construction, percentage of wastage in a school by age groups, and the personnel required for any particular part of the administration.

d. The aim should be to build up a body of figures on the following lines:

i. Student population broken down by sex, city and rural, grade in school, ostan, and type of school.

ii. Teacher population broken down by sex, location of work, amount and type of training, type of teaching (level of schools), and length of service.

iii. Financial statistics on income to schools from the following sources:

Pious Foundations
National budget
Municipal taxes
Private donations
Student fees
Income from production of schools,

broken down by location, type of school, public or private ownership.

iv. Financial statistics on expenditures for education permitting an analysis by city, by shahristan, by ostan and on a national basis, of:

Administrative costs
Salaries
Travel
Rentals
Operating expenses (lights, and so forth)
Depreciation of property
Expendable items of supply
Capital investments, and so on.

Operating costs
Unit cost of instruction by schools and localities
Boarding costs
Construction costs by types of schools and localities
Maintenance costs.

c. The Central Statistical Bureau should further provide to the statistical section in the Ministry figures on literacy by age and sex whenever the population census has been taken, and figures of population by ages against which the school population can be set.

2. Valuable though these quantitative statistics may be, one of the main purposes of statistics in education is for educational measurement. Great developments have been made in the scientific study of educational methods in recent years along this line, and it has been recognized that the large issues in educational method cannot be disposed of except in the light of actual investigations. It is vitally necessary to measure the ability of children to learn and to adjust subject matter and methods of instruction to the various needs and aptitudes of the pupils. It would not appear that very much research is going on at present on the subject of the aptitudes of the Iranian pupil, nor that the methods of teaching are being checked by a process of scientific measurement. To take one simple example from arithmetic, it is a well-known fact that the various combinations of numbers offer quite different degrees of difficulty to the pupils; there is no reason to suppose that this order of difficulty is necessarily the same with Iranian children as it is with British or American, since recent research has shown that there are differences in order even between these two. In the same way a child can be taught subtraction by any one of the four methods—decomposition, equal addition, decimal complementary and complementary addition. These methods have different values, and here again, while extensive studies have been made in the United States and Britain, none to the knowledge of the present writer has been carried out on the children of Iran. Yet in writing the simplest arithmetic textbook it must be decided beforehand which of the methods is adapted to this country. This is only one, and a very simple, example of the need for statistical research.

There is therefore a tremendous field for the study by experimental methods of the varying aptitudes of different children and their intelligence, and the advantages or disadvantages of different methods of teaching in almost all subjects. To analyze such results requires a knowledge of high statistical techniques, though a start can be made with a simple analysis of the results of standardized tests by such devices as straight linear correlation.

It is recommended elsewhere in this report that a planning and educational research project be developed, which will include work on educational services. Under this at least three items, namely, a guidance program, a psychological testing program, and the preparation of textbooks, require statistical work of a high order. It is clear that at least one of the technical consultants advocated in the educational section of the Plan must be an educational psychological statistician who will commence in the first year of the Plan the necessary research work. It is not desirable at this stage to give any detailed recommendations, for this specialist will undoubtedly wish to design his work in his own way and to decide which testing should come first and the appropriate statistical techniques involved; but it is clear that a series of tests will have to be devised which are statistically standardized and which cover intelligence, mechanical aptitude and achievement. Special tests on such points as the arithmetic example above will have to be devised to allow the practical preparation of good textbooks.

The above is a most important recommendation and must be very early carried out.

Budget

The whole of this cost should fall against the education part of the Seven Year Plan budget.

Justice and Crime

Statistics in this field can generally be considered under three heads:

1. Statistics of the crimes committed which are the province of the police and which are capable of exact record and detailed analysis. They form in most countries an integral part of the police organization, and in larger cities are frequently maintained on mechanized accounting machinery.

2. Statistical data on the operation of the machinery of justice after the person accused of the crime has been detained by the police. Such statistics may be viewed from the administrative angle, that is, merely as a record of the work of the courts (in which case their scope will be widened to include civil cases), or may be considered (for criminal cases) from the point of view of operation of the penal code. From this angle it is important to connect statistics of convictions and sentences with the police statistics of commission of crimes. The police statistics give as it were a diagnosis of the kinds of disease which affect the body politic (though not necessarily of their causes), while the statistics of justice give an impression of treatment (though not necessarily of cure).

3. A further stage is found in the statistics relating to prisoners in the country's jails.

It was apparently thought that the statistics under 1. and 3. above did not fall within the scope of this report and therefore they have not been examined; this does not necessarily mean that their records might not benefit from proper examination by a member of the staff of the proposed Central Statistical Bureau. It may be, for example, that the police might find it convenient to utilize the machine pool of that Bureau for the analysis of their statistics, and it is certainly the case from what has been seen of the police statistics in a second-hand form that no attempt has been made to set them against population, to show causes in the case of accidents (the most important factor in accident prevention), or to give the figures a complete coverage for the whole country. Such figures as existed in the statistical section of the Plan Organization in regard to jails were clearly incomplete.

Apart from the above remarks the whole of this section is devoted to the statistics on courts maintained by the Ministry of Justice.

Present Situation

A statistical section has existed in the Ministry of Justice for several years with a now well-established system of receiving returns from the courts at various levels. Separate groups of returns are received for civil cases, and criminal or penal cases.

For the former a form is received from the lowest courts, that is, the Tribunals of First Instance, which are at shahristan level but with subsidiary courts in some cases at bakhsh level, usually under a shahristan. The lower courts are limited in respect to the cases with which they may deal. These forms show various details on the type of case. The forms are usually received from the shahristan courts rather than from the lower

level courts, unless these are independent. Another form is received from the higher Court of Appeal in the ostan.

For criminal and penal cases another set of forms is received, of which the first comes from the Parquet of the Court of First Instance in which elaborate details are given of the accused, his date of arrest, the crime with which he is charged, and the opinion of the procurator. For penal cases completed in the Courts of First Instance at the shahristan level, there is another form with similar details, and a third continues the history of penal cases when they are brought before the Court of Appeal. Criminal cases are normally not completed at the First Instance level and are dealt with by a Court of Assize from which yet another form is received.

The highest court in the country, which may be called the Court of Cassation, has branches for the various types of case, and from this returns are also received.

The above forms are analyzed in the statistical section and a number of tables are produced for the Ministry of Justice publication; but the system is an old one and suffers from inflexibility. Thus if it is desired to obtain statistics of the crimes of minors (which normally do not come up to the higher level courts) the Parquet forms must be analyzed in detail. The same rigidity of the system results in a failure to produce the most interesting type of criminal statistics, that is, an analysis of cases by the kind of crime, the age and occupation of the criminal, and so on. There is a tendency to regard the statistics as being records of the operation of the Courts of Justice, that is, in a sense administrative statistics of the judicial machine rather than an indicator of a social phenomenon.

A system was devised, however, by the former chief of the section, by which when a case comes before the Parquet the details are recorded on a sheet in duplicate with an indication of the motivation of the crime and many details on the accused, including his photograph, physical characteristics, fingerprints, and so on. Attached to this form were a number of coupons, linked by number to the main sheet, on which the main items of information were repeated, the intention being that when the form was received in the Ministry of Justice the coupons would be detached and used for various cross indices to the main forms, for example, index by nationality, index by type of crime, and so on. When the case had been dealt with, a continuation sheet with the result would follow the first. It is understood that this ingenious system has not been adopted for various reasons.

Recommendations

It is clear that on the present system the statistics are those of the judicial machine and not of crime or its consequences. It seems very desirable that the emphasis should be switched to the latter aspect and consequently it is recommended that the system be reorganized with this in mind. There seems little doubt that the proposed new system would meet statistical needs much better than the old, but that the use of coupons was considered simply because of a lack of office machinery, for it is in effect an ingenious amateur punched-card device. A detailed recommendation cannot be made here, as prolonged study is required by persons closely acquainted with the Iranian legal system. It is therefore recommended that in the second stage of the Plan a small commission be established consisting of one representative of the Central Statistical Bureau and two of the Ministry of Justice (one of whom will be chairman) to set up a new system, from which true statistics having both a legal and social significance can be derived. It is quite probable, having in mind the various cross analyses necessary, that this system can utilize the

machines of the punched card pool of the Central Statistical Bureau. This recommendation is not of the first but of the second priority among the statistical recommendations of the Plan.

Budget

Printing costs in initiating a new system should be met from the ordinary revenue of the Ministry of Justice, and indeed no extra statistical expenditure will be required, as probably some staff can be saved if the records are mechanized. The cost of machine work will simply be absorbed by the Central Statistical Bureau as part of its servicing function. There is therefore no special budget allocation.

Social—Labor

Labor statistics are of great importance in the Seven Year Plan, partly owing to their social implications and partly from the point of view of productive development. It will be difficult to take action on recommendations for new and great enterprises, whether the extension of existing factories or the construction of new works, unless we can make a labor budget as well as a financial one. Without costing of the schemes from the labor angle, and without knowing the supply of labor and its categories on which we can draw, a new scheme may well be initiated before it is realized that the labor for its execution is not available.

From both the social and the productive point of view the principal labor statistics necessary are, of course, those on employment, unemployment, total labor force, and wage rates.

More important for their social implications but also necessary for productive development schemes are statistics on industrial accidents and diseases, social conditions of workers, statistics relevant to social insurance (such as age groups, family structure), conditions of labor, and welfare.

We also need to know the statistics of unions, and the number and outcome of industrial disputes.

The most important and basic figures in a scheme of labor statistics, and certainly the most important from the point of the Plan, as stated above, are those of employment, unemployment and the labor force. Such figures are always necessary for forecasting changes and developments in the industrial structure. Such statistics should consist both of an annual conspectus of the whole situation and of current figures. The need for such statistics is very well put in the International Labor Office publication, Employment, Unemployment and Labor Force Statistics (No. 7 in the New Series of Studies and Reports). One paragraph is worth quoting in full:

> "Effective social policy in periods of reconstruction, even more than in wartime, must be based upon a knowledge of the number and characteristics of both present workers and those potentially available. Such data can indicate the number of persons in unemployment or not in the labor force who may be drawn into productive activity. They can suggest the limits of available labor supply under specified conditions. They can point out the actual uses of manpower by industry. Thus in one country, for example, data on the increasing number of persons engaged in nonessential construction activities in postwar

months emphasized the possibility of using that labor in other activities. To reconcile manpower needs with supply, and to do so with as much skill and precision as possible, current employment, unemployment and labor force figures are valuable tools."

The moment is particularly opportune for the establishment of a proper system of labor statistics in Iran, not only because of the advent of the Seven Year Plan (an argument which applies to most of the statistics described in this report), but because the labor law has just been passed by the Majless. This Law which, in a somewhat different form, has been in existence for some time as a decree, defines a worker as a person working in an enterprise under the orders of an employer against payment of a fixed wage or salary. The Law gives certain regulations in regard to hours of work, level, the employment of women and children, industrial agreements, discharge, funds, wages and the like. With this definite step forward in the treatment of wage earners, a new system of labor statistics should begin.

Present Situation

Labor statistics are at the present moment mainly but by no means entirely handled by the Statistical Section of the Ministry of Labor; and therefore it is fitting to commence with a discussion of the work of this Section, which serves the Social Affairs, Employment, and so forth Departments lying under the Director-General of Labor, but is itself directly responsible to the Under-Secretary. The department's full title is the Office of Statistics, Information and Publications, and in fact the Statistical Section proper is only one of five sections forming part of the department. The section itself consists of a head and approximately half-a-dozen clerks of whom one is a draftsman.

To some extent the work of the section is colored by the fact that the Ministry of Labor was detached about two years ago from the Ministry of Mines and Commerce (now the Ministry of National Economy). The Statistical Section of the Ministry of Labor was then a statistical section in the Ministry of Mines and Commerce, and as a result still has a slight bias towards the handling of statistics of production as well as of labor proper. The work of the Statistical Section may be discussed under seven heads:

1. The section maintains a list of factories which was originally taken over from the Ministry of Mines and Commerce, and this list has been added to as a result of the census of labor discussed in (2) below. No factory is recorded which employs less than 10 workers (if it has power) or less than 20 (if there are no power-driven machines), hence the list does not cover all industrial employers of labor, nor would it be easy to make it do so, for many small workshops spring up in obedience to some economic trend. Distributive trades are not included. It is this list which is used as a basis for the recording of labor census statistics. The list was made complete as far as possible up to the end of 1325 (1946), and has since been kept amended, partly by checking the issue of new permits by the Ministry of National Economy, and partly by the revision produced by the annual census taken through provincial labor offices. Since a factory does not always start when a permit has been issued, it is necessary to check the establishment with the provincial office and this is, correctly, done. The records of the factories are maintained as part of the card index system for the annual labor census which is described below.

2. The principal statistics maintained by the section are those resulting from the annual census of labor. An original census was taken in 1325 by means of a questionnaire containing no less than 36 questions, a somewhat shorter form, however, being used for smaller factories. (This questionnaire, which may well be thought too long, was itself preceded by separate forms for each type of industry; but these were found impracticable.) The questions include such items as the date of establishment of the factory, its capital, its possible expansion, wear and tear of machinery, raw material and output, electric output, expenditure and working days, besides the normal type of questions on labor for example, numbers, ages, wages, allowances in kind, welfare, family structure, literacy, and so on. A somewhat different form was utilized for mines, and the questionnaire for factories is now a shorter one.

   These forms are at present sent out annually to the provincial labor offices who, it is understood, found the original 36-question form with its many enquiries on production somewhat burdensome. At some provincial headquarters it was found that the form was filled in as a result of personal visits by the employees to the factories, which is the correct method; at others the form was sent out indiscriminately to Government and private factories, and the resultant copies were then sent to Tehran. The answers would, however, appear to have been checked; and owing to the fairly good knowledge that some local labor offices have of the factories it is not thought that the data are particularly inaccurate.

   When the returns are received in Tehran the information thereon is dealt with in three ways. Some of the information in much detail is transferred to sheets which form a summary for a province by type of factory. Some of the information is simply left on the forms, which are eventually filed in covers by type of factory. Finally, some items of information are extracted and placed on a card index which shows identifying particulars of the factory (including some items which are not relevant to labor, such as total expenditures, value of product, original capital, number of spindles), but also contains some of the basic labor information. The main virtue of the card, apart from its clear design, is that it includes columns for all the years from 1324 to 1330 (1945 to 1951), so that comparable statistics are brought together.

3. In addition to the annual census, local labor offices also submit annually a consolidated labor return showing by type of trade the total numbers of workers in the area, whether male, female, or children, and their average daily wages. From the information given by provincial offices it would seem that this return is not really regular and that the method of constructing it varies; for example, in Isfahan it was possible to produce it from the register of workers, but in Sari, which does not have such a register, recourse was had to the factories. The return when examined appeared to be incomplete.

4. The statistical office was found also to have requested from provincial labor offices a return showing for each factory the number of sick, divided into those who were ill for one day only, outpatients, bed cases, and so on. This return was last year being sent spontaneously by the Isfahan provincial office, who found it fairly simple to produce as the result of their having a more detailed system of registration of workers than had by then been introduced in the other provinces. Tehran, however, had apparently asked for the return only monthly, and even this seemed to be causing difficulty elsewhere than at Isfahan.

5. The minimum wage rates in the country are to some extent fixed on the basis of a family budget, the quantity of foodstuffs, clothes, and so on, necessary in the month to maintain what is regarded as the minimum standard of living. This standard quantity has already been drawn up; but the statistical office receives occasionally figures from the provinces on request, giving for the specified list of articles the price range in the area. These figures were being averaged by the statistical section to produce a straight price average for the country; and it must be emphasized that there was clearly no intention of producing a cost-of-living index which would duplicate that of the Bank Melli, but simply of assessing the present price of a fixed minimum budget to give some idea how wages should fluctuate. It would appear that wage rates in the ostans are based on the ostan data; but it was found at Sari that the municipal fixed prices are taken for many articles. These prices do not necessarily reflect the real price in the open market which the laborer will have to pay.

6. Statistics are also maintained in the Ministry of Labor statistical section on hand industries; but though these are of great importance in Iran, it has been found very difficult to obtain them. One such study was made on hand loom weaving in Yezd. The location of these looms is known locally, and through the local administrative authorities and the labor office it was arranged that a representative visited the various houses having looms and filled in a form showing the number of looms, average consumption of raw material, production, cost, labor conditions, daily average wages, number of working days, and so on. Very few statistics seem to exist on the important carpet industry. It might be added that outside the Ministry of Labor organization quite useful information on hand industries was found to exist in the Ministry of National Economy office in Isfahan.

7. There are also certain statistics on industrial disputes; but it is not clear whether these cover the whole country. Thus in the Ministry of Labor Revue du Travail No. 21/22 there is a table showing the number of complaints, and so forth, settled in the first nine months of 1327 (1947), (page 26); but the headings are not very clear and it may be that the figures refer only to Tehran. Certainly the figures in this same issue on the work of Factory Councils do so refer.

The above statistics are utilized by the statistical section in various ways—those of industrial disputes, workers' compensation, and so on, and the work of the Factory Councils, are occasionally published in the Revue du Travail, while those on prices are utilized as referred to above. Various studies on aspects of the other statistics appear from time to time in the Revue; but the principal work of the section is to retain the figures in a consolidated form, attend to any queries received (which unfortunately seem to be rather few), and to publish an annual volume giving labor and production statistics for all the factories in the country for which records are held. The most recent publication of this kind is that for 1326 (1947), which is extremely well laid out and on the whole remarkably complete. In the Introduction the general trend of production is discussed, and to some extent the condition of workers, and mention is made of the fact that the rendering of statistics is still unsatisfactory, and that many factories and even some provincial offices do not cooperate. The principal tables show for each kind of factory, and for each factory separately, its type of work, date of establishment, capital, power, output, rate of annual production, number of workers (men, women and juveniles), average daily wage, number of literate workers, sickness and deaths, and amount paid monthly in insurance. Unfortunately the data on production, which it is after all not really the Ministry's job to collect, are a good deal more complete than those of labor. Nevertheless the statistics do

show a very interesting picture of the country's industry and of the labor force engaged therein. In addition to the statistics of factories there is a list of power stations with their output and details, and there is a summary which estimates the degree of non-response. A second set of tables cross analyzes the statistics by provinces and the type of factory; details are also given of mines, and there are some specimen lists of daily wage rates. There are also some statistics on the sick covering the year, and a list of new factories licensed for establishment. Although these statistics are not complete and in particular show gaps in the important field of labor itself, this is nevertheless the most complete single publication on industrial production and the labor force which exists in the country. The Ministry is to be congratulated on the energy and conscientiousness in which it has assembled and so handsomely published these valuable records. They will, however, have to be made more complete, as the Ministry itself realizes, and to this end the recommendations which are later made in regard to improving a census of labor statistics should be carefully followed.

The statistical section also utilizes its figures for the production of graphs. These though on the whole satisfactory are subject to one or two minor criticisms; thus the titles are not always clear, dates, for example, being occasionally omitted. While line graphs are more suitable for time series and bar charts for comparison, this is not always observed. In a graph showing illness for each factory in Isfahan the figures are not very revealing, for at the time when the graph was seen no attempt had been made to calculate the incidence of sickness as a percentage against number of workpeople, so that the largest factory naturally showed the largest number of sick. This is not the object of the graph, which is clearly to show which factory has the greatest tendency to sickness among its workers. Returns where bars are twisted round in a circle should be avoided, and it is particularly recommended that graphs in which pictures of matchboxes, workers, and so on, are set against each other to compare output of match factories or number of workers in different factories should be abandoned at once. The human eye finds it easy to compare the heights of two simple bars or straight lines, but very difficult to compare two objects having area, particularly if it is the areas which are proportional to the numbers charted. Thus if the picture of a worker in one factory is twice the height of the picture of a worker in another, the natural tendency is to assume that one factory has twice as many workers as the other, whereas in actual fact it is the areas which should be compared, a feat which the eye cannot do. (One way to overcome this difficulty and still give pictorial emphasis is to use little unit size drawings and arrange them in bars). The principal criticism of the graphs, however, is that they are too much concerned with production and too little with labor.

Some further general points which may be made in regard to the Statistical Section of the Ministry are: The shortage of space in the office, which has now been greatly remedied; some staff shortage; the fact that in the provinces there is no official working full time on statistics; a certain lack of discipline in the provincial offices, in that they are inclined to reply to requests for figures somewhat late; lack of utilization of the section as a proper central statistical section for all departments of the Ministry; incomplete rendering of returns by factories, which is probably to a large extent the explanation of provincial lateness.

In addition to the statistics handled by the Ministry of Labor Statistical Section dealt with under the seven heads and general discussion above, some other statistics of labor exist within the framework of the Ministry. Of these the most important is the employment index which, it is intended, shall be built up in all the labor offices. The purpose of this index is partly to register

workers and partly to provide a means of controlling unemployment, and its operation was examined in detail in the labor office for Tehran. The intention is to supply each industrial worker with a book which is to be his official introduction book and to carry his personal particulars, including his identity card number, education, technical knowledge, previous work, various dismissals, and so on, salary, and receipts from the Insurance Company of Iran or welfare funds. It also shows particulars of his union membership, marital status, and so on. When these books are issued to the workers by representatives of the Ministry visiting factories, a form is also made out showing the number of the booklet issued and some of the main particulars from it. This is filed with the local labor office. A serial number is supposed to remain with the man thereafter. It was intended to have a similar system for Government employees on disponibilité, but this system has not been applied.

If an unemployed worker reports to the office his name is put into a register, and demands are also received from employers on a special form. The man is then given a card to take to the employer to whom he is recommended, and those sent are listed in a second register. It would appear that different sets of serial numbers are given to the workers in the two registers. Another form is made out from the first register and filed, and if the man is taken on by the employer the latter returns the card which was given to the worker. The man's documents are filed in a personal file, but for each man there is a small green card which is placed in a card index by trade. On the whole this index is not a very successful cross index to the files, owing to the practice of men having more than one occupation and the unemployment situation. The card appears to be linked to the first unemployment register by the serial number. It does not appear that a very good linking system exists between the employment and the unemployment records.

It should be added that in Isfahan a slightly different system prevailed at the time of visit. The unemployment cards were not then being used, workers were registered on a somewhat different system and there was another card index. In Isfahan when the worker moved from one factory to another his name was shifted in the register.

There are also some statistics in departments of the Ministry of Labor other than the statistical section; for example, in the Co-operative Section there is a little information on this subject, while social insurance figures are received from the Insurance Company of Iran to some degree. The potentialities of the Company's records, however, have scarcely been tapped. The Department of Labor Economics apparently receives prices of foodstuffs from the municipalities, and it may be that this is a duplication of the prices received by the statistical section. There are also in the Department of Labor Supervision some statistics on unions.

In addition to all the above statistics in the Ministry of Labor, there are (besides the figures of the Insurance Company dealt with in the appropriate section of this report) some statistics of a labor nature maintained by the Bank Melli. These are the statistics from which is compiled the wages index, the construction of which is described in the Bank Melli Bulletin No. 77 (August/September 1945). In this it is stated that the Bank eventually intends to prepare index numbers of all wages, but at the moment the work is confined to the building industry. The intention was, of course, to obtain an index of real wages by setting the wages index against the cost-of-living index. The industry was chosen because it had developed rapidly. Figures are obtained weekly from selected firms on a special form showing the wages paid to each of a number of categories of workers, these categories having been drawn up by the Bank after consultation with a number of architects

and contractors. The wages are carefully entered in registers with a column showing the number of companies rendering figures on that particular grade, so that averages can be properly calculated, and the figures are averaged over the weeks to give a monthly average. Within the seven principal groups into which workers have been divided simple averages are made; but in calculating the index the groups are properly weighted. This was done by a careful system, in which it was calculated what percentage of the work at each stage of a building was done by each one of the particular groups. It was then found what proportion of the work in several different types of building was devoted to each one of the stages, and the combination of the two sets of proportions gave the weights. This system seems quite sound. The wages are expressed as percentages and each weight is multiplied by the simple average wage in rials per day for each of the seven grades to give a weighted average wage. The index is calculated by setting the present weighted average against the weighted average for Farvardin and Ordibehesht 1324 (April 1945). On the whole the calculation seems to be satisfactorily and carefully made.

Recommendations

Organization

1. The Statistical Section of the Ministry of Labor should have its functions properly laid out in an order or instruction to be circulated by the Under-Secretary to all parts of the Ministry. This order should lay down that the section is the main center for statistics in the Ministry and should define which statistics will still be maintained by other departments (copies, however, always being sent to the statistical section), and which should be taken over entirely by the section. The section should ensure that there is no duplication in regard to prices with the Labor Economics Department, and should utilize but not run the statistics derived from the employment indices being built up in the labor offices. It should be the sole center for the publication of statistics. One department of the Ministry requiring figures from another department will not refer to the other department direct, but will obtain its figures from the statistical section.

2. The statistical section will handle the annual labor census, the quarterly trades, wages and welfare return, and the other statistics set out under Returns to be handled below. In one or two cases, for example, statistics on unions and industrial disputes, the returns will pass through the appropriate department of the Ministry for checking and information on their way to the statistical section.

3. The section should have at least three rooms since statistics cannot be handled in crowded conditions, and should have a staff of:

   a. Head of section
   b. Assistant to head
   c. Two clerks in charge of factory card index
   d. Two clerks in charge of quarterly return
   e. One clerk on other statistics
   f. One clerk on special studies
   g. One draftsman
   h. One typist.

   The head of the section and his assistant will personally edit the publications. There should be one statistical clerk in each provincial office.

4. Graphs should be reorganized on the lines suggested in the earlier discussion of graphing.
5. The annual publication should eventually show nothing on production except the few details—product, total turnover and horse-power of machines—necessary to identify the factory and evaluate its labor needs.
6. The section should be the sole statistical correspondent with the International Labor Office.
7. Statistics on labor from outside sources, that is, the Industrial Bank, the Insurance Company, and the Bank Melli (wages index), should be received by this section.
8. Eventually the Bank Melli wages index must be taken over by the section.
9. One member of the section should be delegated to study with the Statistical Department of the International Labor Office.

Returns to Be Handled

1. The present annual labor return should be transformed into an annual labor census and handled on a special card index. The method adopted should be that of reporting through the provincial labor offices by the individual industrial establishments, which is at present the commonest method of obtaining such statistics. The aim of the return will be to obtain annually a complete picture on the employment situation in industrial establishments.

   The system can be built up by the following undernoted recommendations:

   a. A new form should be drafted on the lines of the specimens below and should be described as the Permanent Employer's Record, see Exhibit P4. It should be rendered by all industrial establishments having more than 20 workers (this figure can be lowered later), and should be as of a specific date annually. All the information will refer to the situation on this specific day, which therefore must be carefully chosen. It will be necessary to include the breakdown of ages given in the form below, since these represent the different wage scales. The grades of workmen are those of the Minimum Wage Regulations. Additional forms will be rendered for Female Iranian and for Foreign staff.

   b. The purpose of this form is to take a census of the labor employed by industrial establishments at a particular point of time, sufficiently clearly divided by ages and grades to check the application of the labor regulations in regard to salaries. It will also be used in the process of annual wage setting.

   c. The section should be equipped with two visual card index cabinets of the Roneodex or Kardex type of about 30 trays each, for which initially 2,000 blank cards should be ordered, together with six boxes of colored signals and enough celluloid strips for the cards. There will be one card for each factory, and the cards will be arranged by type of factory sub-divided by province. The colored signals will be used to mark late renderers, and so forth, bad or good factories and so on. The design of the card should be such that it will show on one side (and also to some extent on the strip which is visible) the identifying particulars submitted on the face of the Permanent Employer's Record Form. On the other side it should show across the top the headings

of grade shown across the top of the reverse side of the Permanent Employer's Record Form. Each of these vertical columns will be subdivided into three small columns—Male Iranian, Female Iranian, Foreign. Down the side the headings will be those of age group as in Exhibit P4, but instead of the divisions into number, maximum wage, and so forth, there will be four divisions for 1328, 1329, and so on. Only numbers of workers will be extracted from the forms and put on the card; the forms will be filed to keep permanent records of wages.

d. For definitions of employment and of the type of establishment to be included, pages 9-12 and 67-71 of the International Labor Office publication Employment, Unemployment and Labor Force Statistics should be studied.

e. The initial census should be taken by a series of visits to provincial areas such as has already been made. Factories should be visited and the first forms filled in by representatives on the spot. This work should be made a very early priority. When the new cards have been filled in, the existing cards should be abolished.

2. It will be noted that in the above form details of wages by trades and questions on welfare have been completely omitted. This is because it is recommended that a new quarterly return be instituted of which the title might be Quarterly Return of Trades, Wages and Welfare. In addition to a number of questions on welfare conditions in the factory, this return will carry certain tables designed to show the wages paid not only to grades and ages of workers but to the different trades. While the aim should be to build up for this country a trade code classification like that used in Britain, the creation of such a code should not be embarked on prematurely, and consequently it will not be possible to print on the forms a list of trades relevant to the particular type of factory. In any case this would involve printing separate forms for each type. The trade column should be left blank, therefore, and the factory staff will write in the list of trades. It is essential, however, that the Ministry should draft a guide for the use of the inspectors and the provincial labor offices in checking and assisting the filling in of these forms. This guide should show which category of worker is, say, an electrician, and exactly how this should be defined. Precise categories should be established, for example, "electrician switchboard". There is no point in a factory giving such general heads as "wood worker" or "engineer". The aim should be to establish a standard definition of each occupation and of which type of worker is entitled to be so classified.

This form will be received through the provincial offices by the Ministry of Labor statistical section and should be consolidated to give the total number of workers by trades by types of factory. Other very interesting statistics can be derived therefrom, such as average wages for each trade, welfare statistics, social insurance statistics and the like. When the return has been instituted the head of the Ministry of Labor Statistical Section should discuss with a representative of the statistical section of the Plan Organization the extractions and tabulations to be produced from the forms. The return should not be recorded on a card index. After tabulation the forms can be filed in the same order as the cards of the card index representing the Permanent Employers Record.

The design of the form should, it is suggested, follow the lines set out in Exhibit P5.

3. A quarterly return should be sent by the provincial offices on the subject of the industrial disputes and the activities of Factory Councils and the use of Factory Funds. This return will be compiled by the provincial offices from information received from Factory Councils and the Settlement Boards.

4. The provincial offices should also render annually a return on the state of unions. The information will be obtained by the office by direct contract with the unions, as more accurate figures will be obtained in this way than by the rendering of returns from the union offices. In essence this is an internal return within the net work of the Ministry.

   The return should show the address of the union headquarters, its membership (men and women), its date of registration and the registration certificate number, type and amount of subscriptions, how frequently these are asked for, how many members are fully paid up and in good standing, the funds in the bank, and whether the union is represented on Factory Councils or Settlement Boards. This return will be very valuable as showing whether a union is playing a part in negotiations proportionate to its strength.

5. The Insurance Company of Iran should send regularly to the statistical section statistics on industrial accidents. In this connection reference should be made to the International Labor Office pamphlet Methods of Statistics of Industrial Injuries; being No. 7 of the New Series of Studies and Reports.

6. From their unemployment index, which is discussed both above and below, provincial offices should render a quarterly return on the unemployment position. This return should be designed after careful study of the International Labor Office pamphlet on Employment, Unemployment, and Labor Force Statistics, particularly of pages 12-14, 23 and 78-100.

7. The Ministry's statistical section should initiate a special study on labor in building trades, which will be of importance in the Seven-Year Plan.

8. The section should continue to study hand industries and should widen the scope of this investigation.

9. The section should continue to handle cost-of-living data for the establishment of wage rates but should co-operate with the Bank Melli in this matter.

Employment and Unemployment Index

The system as at present applied is complex, but much work has already gone into its design and commencement it should for the moment be continued. A small commission should be set up, however, consisting of two representatives from the Ministry (one of whom should be from the statistical office), one representative of the Tehran labor office with experience in handling the system, and one representative of the Central Statistical Bureau, in order to examine the system in detail with a view to simplification. The main aim should be to place the records on a card index rather than in registers. It is considered that the register system at present used is unsatisfactory, since it is very difficult to keep a book register "alive". As far as could be seen the registers do not show anything about what happened to a worker registered in some of the earlier and now "dead"

pages. It is also thought that the worker's book, while it has advantages from the point of view of control, is not really in principle desirable. The record in the book is a limiting factor on the employee, for his maximum standard and previous dismissals are always recorded therein so that he has little chance of bettering himself. Unfortunately the book system has now proceeded so far that it will be difficult to change it, and for the moment it should be continued; but the question of its use should be carefully considered by the commission.

The commission should also consider the practicability of employing punched cards (utilizing the machine pool of the Central Statistical Bureau) for the recording and analysis of employment. A card which would be known as the "statistical card" would be punched for each person recorded under the registration system and would show the following details:

> File number/sex/year of birth/nationality/occupation-industry-personal occupation/year first employed/year unemployed (when relevant)/residence-present-original/present employment-firm/wage-daily rate/piece work wage reduced to an average daily rate/literacy/union member/family responsibilities/whether insured/medical information.

Budget

The cost of printing organization and purchase of card indexes and increase of staff may well be fairly considerable. It is difficult, however, to see how they can be set against any part of the Seven Year Plan budget; and the Ministry of Labor must therefore be prepared to accept them against its normal budget.

Defense

This subject is not included in the scope of the present report. It must be emphasized, however, that an Army is in essence a miniature of a country and that for its proper administration in peace and efficient control in war exact and detailed statistics are required in its General, Corps, and Divisional Headquarters. Such are manpower (equivalent to population), casualties, discharges and recruitment (equivalent to mortality), health (morbidity), literacy and training (equivalent to education), discipline (crime), trades (labor), equipment, ammunition, vehicles, stores and supply, and finance. The proper ordering of a convoy in vehicles to the mile and miles in the hour, the organization of supply points, the calculation of ration stocks required, the allocation of rounds per gun, the demands on training establishments for certain trades—all these are, in fact, statistical calculations based on known statistical data. An army's operations, in the words of a Royal Statistical Society report, are run on facts; and the interpretation of numerical facts is a specialized accomplishment. An army therefore needs not only statistics but statisticians, and in fact a statistical branch. Such a branch can advise on office efficiency, the use of mechanical devices (for example, in counting manpower), and help to check that flow of paper and forms which seems inseparable from any large military organization. The existence in an army of a higher degree of discipline than exists in the civilian population no doubt encourages this flow; it also renders easy the collection of statistics organized to a high degree of accuracy and submitted to commanders in a compact and useful form. An army, in fact, is an ideal field for the complete collection and clear analysis of the figures necessary to run it, and valuable experimental work can in addition be carried out on this fixed and tractable portion of the population.

PRODUCTION

Natural Resources

Land Settlement

The natural resources of Iran which are dealt with in the first part of this chapter are, of course, the land itself, its water, the crops which are grown on the land, forests, the fish in the Iranian seas, and the oil and minerals. The statistics of water, crops, and so on, though not always existent are easily definable and are dealt with in the succeeding sections of this chapter. In regard to the land, the soil itself which is the ultimate source of all productivity, the position is complicated by the fact that we may treat this resource statistically from four angles—from the point of view of the legal ownership of the land and its registration; by taking a soil survey; by considering the utilization of each piece of land in the country; and by studying the actual land tenure system itself and its effect on the country's economy. Consideration from the second angle forms a part of the agricultural report and is therefore not covered here; while a land utilization survey involves such wide issues and the combination of so many other surveys that it may be best handled as part of the proposed agricultural census. It is desired to discuss in this section, therefore, only the first and the last aspects of the land problem.

Present Situation

System of Land Ownership

The land tenure system in Iran is widely recognized as being feudal, in that the landlord owns the land and the village and the peasant carries out the agricultural work on a share-cropper basis. The division of the product of the land is made on the age-old principle that there are five factors:

a. Labor
b. Land
c. Water
d. Seed, and
e. Animal power, that is, draught oxen.

Each of the factors provided either by the landlord or the peasant secures to the provider one-fifth of the crop. In many cases the peasant furnishes only labor or labor and draught animals and thus his share of the crop is never very high.

There is little clear information on how this system of land tenure operates, but it is pointed out elsewhere in this report that the system is such as to encourage absentee landlords, and that the water rights system is such as to discourage development. It is pointed out that the principle that water gives "value" to the other four factors is ignored.

System of Land Registration

The legal registration of lands is carried on by a department of the Ministry of Justice, which receives from each ostan monthly a return showing the progress of registration in the area. It would appear that local registers exist in the ostans, covering with numbers but without areas most parcels of land, though this may not cover even the entire cultivated part of the country. The returns show the progress made in registering with ownership the various pieces of land and property. Unfortunately the statistics are mainly

concerned with the progress of the work of the registration offices rather than with analyzing the ownership position which the registration has revealed. Thus the returns include details of cash received in fees and of such legal matters as mortgages. For some reason the returns also show marriages and divorces registered by notaries—perhaps this is merely an administrative control.

In addition to the above there are six-monthly returns, and all the figures are entered in the registers in the Ministry of Justice with a view more to judging the administrative efficiency of the various ostan branches than for any other purpose. It may be doubted whether it is a fair way of judging these legal offices to check whether there are more mortgages than last year, which after all may not be a very favorable economic indication.

Recommendations

1. It is recommended that studies of the land tenure system be made by the Ministry of Agriculture statistical section working jointly with the agricultural section of the proposed Central Statistical Bureau. Some work of value has already been done in this field, and this should be carried further and an investigation of crop sharing as an incentive or otherwise to productivity should be added. Some change in the land tenure system of Iran may well be found to be basic to the success of the Seven-Year Plan, and consideration of this cannot proceed blindly.

2. It is of the greatest importance to the Ministry of Agriculture and the agricultural part of the Plan Organization that the ownership of land be properly registered everywhere, not only in the case of agricultural land but for forests. Government properties must be clearly known and defined for they will be needed for demonstration purposes and for forest control. The work of registering lands by the Ministry of Justice should, therefore, be expedited and, if necessary, special offices opened. Some minor changes should certainly be made in the present system; for example, there is no need to record marriages and divorces in the forms sent up, as this is handled by the Civil Registration Department, and in general returns should be made less administrative and more functional. The clerk in charge of the work in the Ministry of Justice should be supplied with an adding machine of the Plus Adder type, and the records of the position of each piece of land should be eventually placed on a card index to be kept by the machine pool of the Central Statistical Bureau, which should make them available to the Ministry of Agriculture as the framework on which to build its agricultural census.

   Action in expediting the work should be intiated by the Ministry of Justice, but assistance in methods in the placing of records on machines will be a function of the Central Statistical Bureau.

Budget

Any extra costs will have to be borne by the Ministry of Justice, except in so far as some assistance can be given from the funds of the agricultural part of the Plan.

Water Resources

As pointed out in the section of Volume III of this report dealing with water resources, the real limiting factor to agricultural development in Iran is irrigation water, for the rainfall is fluctuating and uncertain and tends to produce winter crops. It is also emphasized in the same section that one of the factors retarding irrigation is lack

of statistics, for except on the Karun River and in a few other places there are no good hydrological statistics available. It is, therefore, extremely important that all streams which are likely to be used for irrigation should be measured over a long period to find out maximum, minimum and average flow, the former from the point of view of construction work and the latter from the point of view of the irrigation capabilities of the stream. It is also important that some statistics be obtained on the quality of the water, the relationship of rainfall to volume, the silting of rivers and so on.

Present Situation

The Irrigation Department is of fairly recent formation and consequently has had little opportunity to build up long-term statistics. The Department is, however, fully aware of the need for figures and has in fact a small statistical section. The work done at the moment is concentrated on:

1. Measuring the water flow in certain rivers, taking level three times a day and volume at the beginning of each month in cms.
2. Certain figures on rainfall and temperature.
3. Some measurement of silting and suspension.
4. Some statistics of the numbers and length of canals and kanats.

From these figures a number of calculations are made and graphs are constructed. There is no doubt that the work of this section is on the right lines but not sufficiently extensive.

Recommendations

Volume III of this report in the section on water resources envisages a strong Central Water Authority which will be in a sense the trustee of all the water resources of the nation. The statistics of this authority will be of major importance from the point of view of drawing up the National Annual Water Balance Sheet of which the concept is introduced in that section. The exact nature of the statistics should be left to the specialists employed, but the following points are recommended to be borne in mind:

1. The statistics should cover not only water used for irrigation but also potable water. Hence there will be no need to build up in the Ministry of the Interior any statistics on the drinking water supplies of municipalities. The statistics required for navigation water and on hydro-electric schemes will also be maintained by the Central Water Authority.
2. The Water Authority will not, however, do the initial calculation of the water needs of particular areas of land for particular crops. This should be made by the agricultural research organization and passed to the Central Water Authority. Close co-operation will be maintained in this work.
3. Special attention must be paid to figures on chemical analysis of water, silting, snowfall and evaporation, of which almost no records exist.
4. The need is very urgent for the establishment of a much wider series of hydrological measuring stations. These may have automatic apparatus.
5. The municipalities must provide to the Central Water Authority adequate statistics on use, quality, quantity and occurrence of water supplies within the city boundaries.
6. Statistical data on engineering matters in regard to water will not be in the main statistical section of the Central Water Authority.

Budget

Costs of this service will be borne by the funds for water resources development.

Agriculture

Iran has, with its great natural resources and extremes of climate, always been a predominantly agricultural country, and despite recent expansion of industry the major occupation still remains agriculture. The development of the natural resources is, therefore, of the utmost importance in the Seven Year Plan and this development cannot be carried out without agricultural statistics. Unfortunately, there is no agency in the country which regularly collects complete data on agriculture and there is no regular agricultural statistical publication. In particular, although some figures on crop estimates do exist, there is no proper census.

Figures for agriculture all over the world are normally of two types—regular estimates of production and figures of prices which form part of a current reporting system and which can never be completely accurate; and the agricultural census which provides a complete survey of the agricultural resources of the country and which is taken only at regular intervals. In some countries, for example, the United Kingdom, the agricultural census has been brought to a high pitch of accuracy and organization and is constantly being expanded to meet the needs of, for example, the Ministry of Food. Other countries concentrate to a great degree on the estimation system; but both are necessary for a properly balanced scheme of agricultural statistics. It is important, as has been pointed out by the Food and Agricultural Organization of the United Nations, that all statistical services related to agriculture and allied fields should be either concentrated in or co-ordinated by a strong statistical unit in each country.

The importance of agricultural development has been recognized in the Seven Year Plan in various papers in which it has been pointed out that Iranian farmers use primitive methods, that the soil is being exhausted, that there are no sound methods of soil conservation, and that it is extremely difficult to know the present situation owing to lack of statistics. A number of schemes have, therefore, been drawn up for the improvement of agricultural methods and for the general raising of the standard of living of the peasant who is, after all, the staple element in the population of a country. In the schemes devised by the Plan, not only will figures be necessary on crops and production, but an agricultural census will at some time have to be taken, while there will be a great increase in the use of statistical techniques for scientific research. It will also be necessary to have statistics of the administrative progress of the Plan.

Present Situation

The existing agricultural statistics on Iran may be dealt with in the present report under three heads:

1. Statistics chiefly of agricultural production, maintained by the Statistical Section of the Ministry of Agriculture.
2. Agricultural statistics maintained by other departments of the Ministry.
3. Statistics of agriculture found rather at random in other Government departments.

Following a discussion of the present system as above, it is proposed to consider the Seven Year Plan for agricultural statistics and to base recommendations thereon.

The Statistical Section of the Ministry of Agriculture

The Ministry of Agriculture has a Bureau of Statistics and Information which forms part of the Technical Division of the Ministry, under a Director-General. The Department has a staff of about 37, among whom the educational level is good but not all of whom are employed on statistics. Apart from the sections of the Department concerned with information, instruction, and so on, there is a statistical section proper which is also concerned with climatic work. This again is subdivided into four small branches, dealing respectively with weather statistics, agricultural statistics generally, forestry and veterinary statistics, and relations with international bodies. As there are only about half a dozen employees on the work, it is obvious that it cannot be handled on a large scale, or in great detail.

Until recently the section received forms from a number of meteorological stations and compiled weather reports. This work has been fully discussed earlier in the present report under climatic statistics.

The main task of the section is, of course, the collection of statistics on agricultural production. The last proper publication of such statistics was in the year 1316 (1937), when questionnaires were sent to the provinces, and in 1319 (1946) another set of forms was completed for Tehran and Khorassan, though the figures of the latter province are apparently lost. In 1326 (1947) another set of forms was dispatched to the provinces, the intention being that they should be compiled by agricultural officials, if possible in consultation with a group of senior men in each village. It would appear, however, that in some cases the records were made up estimating the position in the aggregate for a whole bakhsh. There is at least a 25 per cent margin of error. The forms at present in use, though they resemble an agricultural census, are in effect really production statements. There are 24 different questionnaires, for almost every possible subject in regard to agricultural statistics, including one requesting prices of 126 different agricultural commodities. These forms are in theory checked by the employees on receipt by the statistical office and then consolidated for the various administrative areas. It does not appear, however, that they are either well filled in in the provinces or properly analyzed in Tehran. There are not enough officials in the Statistical Section of the Ministry to cope with this very large task and there are not enough officials in the provinces to ensure that the figures are realistic. The section does not appear to receive statistics on agricultural machinery, or fisheries, but one of the forms deals with forestry. In general, the forms are well designed and require only minor improvements.

It is interesting to note how these statistics were compiled in 1327 (1948) in the provinces. At the Isfahan agricultural office it was found that there are no records in the villages kept by the head man or anyone else of the crop position as compared with previous years; there is, for example, nothing equivalent to the system of village notebooks which exists in Palestine. Moreover, there is a fear of taxation, and so even verbal information may not be correct. It appeared that at Isfahan the figures of the 1319 (1940) agricultural return were still being used locally and that these existed in registers, but the picture given by these may, of course, be out of date. For the present set of forms the system adopted was often to call together the village heads of the entire bakhsh and ask questions. Hence the answers must be unreliable. It was found that a register was also maintained showing, by villages, the amount of seed sown and the amount cropped, that is, a form of agricultural estimation. Prices were more regularly collected. The position in the other areas appears to be similar. There are about 1300 staff employees of the Ministry in the provinces, in approximately 30 provincial offices. These offices are by no means distributed in any relation to the agricultural pro-

ductivity of the areas and hence the statistics are bound to be even less valid in some of the more productive areas than in the country as a whole.

Outside of this system of obtaining agricultural statistics through the medium of the 24 questionnaires mentioned, the section receives other statistics, as, for example, data furnished by the Veterinary Department of the Ministry on animals vaccinated and deaths from various causes. The Veterinary Department also furnishes the numbers of animals killed in the slaughter houses. These do not agree with the figures for slaughter on the production forms since the latter cover all methods of slaughter although they are supposed to omit for the countryside animals not actually killed there but sold for slaughter in the big towns. This list should bear all figures for the city districts, but it is doubtful if it does.

The section does not now produce any publications on agricultural statistics though there was a regular bulletin from 1313 to 1316 (1934 to 1937) and a review before that date.

Statistics Existing in Other Departments of the Ministry of Agriculture

It is not necessary at this point to discuss the statistics on forestry and fisheries maintained by the appropriate departments of the Ministry, since these have been allocated separate sections of the present report. A considerable amount of statistical data exists, however, elsewhere.

1. In the Animal Husbandry Department of the Ministry, figures exist on animals under the various provincial areas for the period 1317 to 1323 (1938 to 1944). From this a seven year average has been calculated and an attempt has been made to estimate total slaughtering by examining the slaughter house figures and the figures for intestine export. This must be a fairly general figure for it cannot be said definitely that the intestines are exported for every animal slaughtered. An assumption was then made that the animal population was constant and therefore that the number slaughtered was equal to the number of births, allowing for deaths by disease. From this estimated figure of the number of births, the number of dams is calculated, which was supposed to bear a constant ratio to the number of sires. The resulting figure cannot be very good as it involves so many estimated figures, and in any case it includes the assumption that the animal population is constant, which begs the question. The Animal Husbandry Department has also breeding statistics, for example from the Institute of Hyderabad, and these records, and those of crossing, milk production, and so on, are much more exact.

2. In the Pest Control Department certain figures exist on anti-pest work, forming a rough record of progress from which consolidating reports are from time to time produced on the work of an area. Fairly good figures also seem to exist on plant diseases and there are reports on quarantine examinations. All these figures, which are of a technical nature, appear comparatively satisfactory.

3. In the Agricultural Division of the Ministry, the Horticultural Section from time to time obtains statistics on horticulture and to some extent on agriculture generally from the agricultural offices in the provinces. Like the Statistical Section, this office complained of failure to reply since the provincial personnel were not adequate in number to deal with the work. The forms used are in effect similar to a small but undeveloped agricultural census.

4. The Agricultural Machinery Section obtains figures on machinery from the Customs records, but at the moment cannot state exactly the number of large agricultural machines in the country, though they have information on certain places. It would seem that a census of those machines would not be difficult, for there cannot be so many in Iran at the moment.

5. Some statistics also exist of research on plant improvement, though these have not been produced in tabular form. Some mathematical techniques are applied to these figures, which can, of course, involve the highest of statistical techniques.

6. In the Veterinary Department are basically compiled the statistics which are received on slaughter and diseases by the Statistical Section. In the case of the abattoirs, the statistics would appear to be quite good, but this remark refers to the official abattoirs only and no figures exist at all for slaughtering in the many small unofficial abattoirs in small towns. Certain duplication evists in that, for taxation purposes, parallel and identical figures are received by the Ministry of Finance. There are also statistics of animals rejected by the slaughter houses owing to diseases, and exact figures on vaccination in the provinces. There are, of course, no figures on animal mortality or morbidity for the whole country, but statistics exist for animal diseases, by type of disease, treated by the Veterinary Service itself. There are also exact figures of serums produced by the central laboratory. It would appear that the Veterinary Department is making a serious effort to build up some statistical information.

Statistics Covered by Government Departments Outside the Ministry of Agriculture

1. Perhaps the most interesting agricultural statistics in the country outside those of the Ministry, and certainly the most highly analyzed anywhere, are those collected by the agricultural sub-section of the former Bureau of Research and Statistics of the Ministry of Finance, now the Statistical Bureau of the Planning Organization. This has collected the agricultural statistics not only of the Ministry but of the Bank Melli, production statistics extracted from the files of the Ministry of Agriculture, some approximate figures on rivers, and so on. Its largest work, however, was to take in 1325 (1946) a questionnaire return from the provinces through the Governors and Ministry of Finance agents. These figures cover for each village details of population, number of families, type of soil, fertility of land, irrigated areas, and so on, water, number of owners, number of animals, and annual average production of various crops. There is also a certain amount of detail on hydrological and meteorological matters.

This information was recorded in registers and on sheets and a number of useful items of information were extracted therefrom. The most important study, however, was that made on the relationship between land ownership and agricultural production and in which the co-efficient relating the two was calculated. This study, or the accuracy of the basic information, was not, of course, guaranteed by the section; but it certainly produced interesting results and was a valuable start. In determining the correlation the effect of the various other factors of production was taken into account. More recently, a pilot agricultural sample study has been made in the Veramin area. This was due to the conviction in the Provisional Planning Organization towards the end of 1327 (1948) that it would take too long to improve the Ministry of Agriculture figures to the point when they could be used for the Plan and that some early information was essential. The survey was intended to find not so much exact

information about Veramin as the type of information which could be obtained and to evaluate its accuracy. Elaborate questionnaires were drawn up, to be applied by officials to certain villages chosen from various areas in the Veramin district which had been broken up on a grid system. The original stratification of the sampling could not be exactly followed owing to snowfall; and while it was advised that the forms should be reduced and altered, it would seem that some impractical questions were still asked. A long study has been compiled and issued on the results which, although its author would doubtless be the first to admit that improvements could be made, is nevertheless of value and points the way to future work in this field. It will probably be found, when the agricultural estimation service recommended below is set up, that this study is of the greatest importance as pioneer work in the field. It may be thought that rather too much mathematical detail is included in the report, but the results are interesting and there is a most valuable discussion of the difficulties.

2. Some agricultural data also exist in the Departments of the Ministry of Finance where they are relevant. Thus there is the information on land tenure and production obtained between 1307 and 1313 (1928 and 1934) for the assessment of the cultivated land tax, which is referred to in the discussion of indirect taxation included under revenue and government accounts in this section. Some of the Ministry of Finance monopolies also have statistics, for example on grain. The latter figures are fairly comprehensive. In a sense the statistics of the Tobacco Monopoly in regard to production and purchase of leaf are also of an agricultural nature.
3. There are also some statistics of an agricultural nature held by the banks; for example, the Agricultural and Industrial Bank has figures on loans and the Bank Melli includes agricultural commodities in its wholesale price publication. Previous to the war, the Bank also collected statistics on almost all aspects of the country's economy in a single general survey, in which there are, of course, some agricultural figures. These are not likely to be very accurate but do serve as a basis for comparative study.

Agricultural Statistics Under the Seven Year Plan

Under the plan for agricultural statistics drawn upon under the preliminary plans of the Seven Year Plan, essential figures are listed (they include some items which strictly come under the census of population) and a scheme is put forward for a proper statistical organization within the Ministry of Agriculture. This organizaton, it is suggested, will in the first two years of the Plan conduct an agricultural census by dispatching 100 groups (three in each) of statisticians to tour the country, including the tribal areas, and to collect agricultural data on an accurate and complete basis by personal inspection. The organization recommended will have a staff of nearly 400 employees, of whom about 320 will be in the provinces (300 of these being the touring group of statisticians, in addition to which there will be 100 drivers). The organization recommended includes two foreign specialists, one as Director-General and one as inspector, the sending abroad of certain Iranian personnel for training (presumably as successors), a number of high level Iranian staff in the headquarters (one assistant director-general and 7 inspectors) and junior staff consisting of 20 statisticians, five assistants and 10 typists. The typists, rather surprisingly, will be paid the same monthly salary as the junior statisticans. In the provinces the organization will consist of one chief and one statistician in each province, plus 300 enumerators and 100 drivers. This plan is in essence sound in that

it aims at the creation of a strong agricultural statistical bureau and shows an appreciation of the need for accurate and complete agricultural figures. After careful consideration it is also thought that the scheme suggested, that is, personal inspection by touring groups, is the only method of taking an agricultural census in Iran and that it may not prove either so difficult or so long as might be expected owing to the system in the country whereby cultivation is usually found around a specific village or group of villages. But the scheme omits certain other statistics which are necessary and above all omits to include any system for the collection of current figures of cropping and production. Moreover, it includes a foreign director-general, whereas it would appear better to have an Iranian administrator and a foreign advisor. The effort also appears to be concentrated too much on the first two years and the number of personnel may be inadequate. Some salaries will also need to be raised. Moreover, the census as envisaged is spread over a period, while in fact information will need to be simultaneously collected in several districts.

It is worthy of note in this connection that, at the instigation of the Council of Statistics, forms for a new agricultural census have been drafted, chiefly by the Department of Civil Registration and the Ministry of Agriculture. These forms are in themselves satisfactory, though the concept that they should be applied by the Civil Registration organization is, of course, wholly wrong.

Recommendations

General Organization of the Statistical Section

1. The present statistical office of the Ministry of Agriculture should be maintained and strengthened and should have a staff approximately equal to that outlined in the Seven Year Plan for agricultural statistics. The salaries of the officials should, however, be slightly higher than those recommended. The aim of this office should be eventually to centralize within itself all the agricultural information in the Ministry with the exception of figures on forestry and fisheries, which should be handled by the appropriate department, figures on climate which should be handled by the Central Water Authority, and scientific research figures which should be handled by the statistical section forming part of the Research and Extension Institute. Copies of the figures produced on all these subjects will, however, be provided to the Ministry of Agriculture Central Statistical Section.
2. The first step should be the selection and appointment of a foreign specialist to act as an agricultural statistician and as advisor to the Bureau. This advisor should have had training in sampling techniques and experience in their application, for example in the United States. The suggested salary is $7500 per annum, together with local allowance and traveling expenses, contingency fund and the like, of Rls. 15,000 per month. This recommendation should be given very early priority.
3. This advisor will study and assist in the creation of a crop estimating organization employing sampling techniques. In the first year it may be necessary to take preliminary estimates from extension service agents sent around the country by agricultural experimental stations.
4. Until this official has had time to study the needs, layout and possibilities of the agricultural statistical section, no change should be made in the organization of the present section. The advisor will work within the framework of the present statistical office and will assist in its organization as the one agricultural statistical central group, its first function being crop estimation.

5. The present forms should be continued until the crop estimation system is fully set up.

6. No attempt should be made to take the agricultural census at the same time as the Food and Agriculture Organization proposed world census of agriculture. Neither the country as a whole, nor the agricultural statistical organization, will be ready for this in time. Instead, the census should be postponed to the fourth and fifth years of the Plan, by which time the statistical section will have centralized all the statistics of the Ministry, built up its crop estimation service, and trained and built up its staff. The census can then be taken on the lines envisaged in the Seven Year Plan for agricultural statistics. It may be possible to economize by utilizing vehicles previously employed for the population census and the enlarged technical staff of the Ministry. During the intervening period the present forms should be carefully studied and a final form drafted.

7. In regard to the crop estimation system, reference should be made to the Review of the International Statistical Institute, Volume 16, 1/4, pages 49-51, which describes the system obtaining in India. The estimation must be done by teams on the spot and by some other method than merely asking questions, for example, by observation at harvest time, by actually cutting and weighing, and by devising techniques for measuring changes in area. It is difficult, perhaps, to appreciate that in this field sampling is just as accurate as an extensive count, but this must be emphasized.

8. The calculation of water requirements will be done by the Ministry of Agriculture but not by the Statistical Department, since it would seem preferable that it should be done by the experimental stations under the Director of Research at Karaj.

Other Statistics and Their Relationship to the Central Agricultural Statistical Bureau

1. Under the livestock disease control and improvement program in the Plan, it will be necessary for statistics to be collected by the department executing this work, but these should be passed through the central statistical organization. In the main, the lines of veterinary statistics already followed are sound.

2. Statistics on diseases and plant diseases will be collected under the pest control program and again pass through the statistical bureau.

3. Statistics on animal husbandry as at present kept are not satisfactory, and numbers of animals should be maintained by the statistical bureau through their estimation service.

4. Any attempt to take a special agricultural census by the Horticultural Department should be stopped. Horticultural figures should be included with the general crop figures of the statistical section.

5. Data from the experimental farms must be sent to the central statistical section through the Director of the Research and Extension Institute. These will be important statistics since they will give variations in yield in different parts of the country in somewhat similarly controlled areas. These will be accurate figures and it should be possible to make on them some study of farm economics.

6. A quick survey should be made of the agricultural machinery existing in the country at the moment and this should be given to the statistical section. Thereafter, as machines are imported or allocations of foreign exchange granted, the records should be sent to the statistical section, which should be able to control the data accurately.

7. Scientific figures should be maintained by the special statistical section forming part of the Research and Extension Institute. They will require the services almost certainly of a specialized biometric statistician and the results should be provided to the statistical section.

Statistics on Agriculture Existing Outside the Ministry

No recommendations are made on this except that all those maintaining such statistics must keep the Ministry of Agriculture Statistical Section fully informed. The future Central Statistical Bureau of the Plan Organization will maintain agricultural statistics and perform higher calculations on them, but in the main will be called on to do less work than at present.

Budget

A budget of Rls. 42,633,000 is allocated in the agricultural section of the Plan for statistical work. Within the framework of this sum the budget allocation suggested is as shown in Exhibit P-6. This budget should be superimposed on the revenue by which the existing agricultural statistical section is maintained.

Forestry

Statistics of forestry are vitally necessary for, as has been clearly indicated elsewhere in this report, forests are of fundamental importance not only for what they themselves can produce but for their general effect on the soil conservation of the country. At the same time statistics of their products must not be neglected; in the F. A. O. Conference of 1325 (1946), for example, it was stated that an organization should immediately be set up to collect periodical statistics on forest products to appraise annually the wood supplies in different countries available for the production of lumber and to prepare material for use in forming long-range and investment production policies.

Present Situation

The statistics on forestry are exceedingly poor. Nothing is exact and in several forest reports recently produced for the use of the Iranian Government the writers have had to depend to a large extent on inspired estimation. The figures should, of course, be principally found in the Forestry Department at present under the Ministry of Agriculture. Yet when visited this Department was apparently uncertain that reasonably accurate statistics of imports and exports of forest products are published by the Customs Administration.

This Department does, however, have some figures of estimated forest areas, which are acknowledged to be inexact and which seem to be obtained from the forest agents. Certain statistics on the ownership of private and State forests are also obtained from the Ministry of Finance; these again are not very exact. The area of existing plantations (under silviculture) is, of course, fairly well-known and so is the figure of land reforested. The figures for loss, for example, by grazing and fires, are very general and there seem to be no arrangements for annual reporting. There are also no specific figures on local production but only an estimate of the totals; and because State and private forests are not exactly delimited, it is not possible to see what effect the local consumption has on such. It is rather surprising that, when the Department was examined, there were not

figures on the actual production of the sawmill, but less surprising that the number of persons employed in forest industries should be unknown. The figures of the personnel and the budget of the Department itself are, of course, adequately covered.

Somewhat more specific figures of utilization exist on a financial basis. There is a charge on every cubic meter of wood cut from the forests, but this charge, which is paid to the Ministry of Agriculture, is concerned only with wood which is actually sent out of the forests, and there is probably a certain amount of leakage. A tax is also collected by the Ministry of Finance agents on local consumption in State forests only, and this figure exists in that Ministry. In a sense this latter duty is not a tax but a royalty. It is also extended to the fuel and charcoal extraction from forests.

In the series of forms designed by the Ministry of Agriculture Statistical Section to assess agricultural production and as the possible basis for an agricultural census, a comparatively well-designed form (No. 23) had been drawn up; but as far as is known it has not been extensively applied.

Recommendations

A considerable part of the development of the Seven Year Plan must hinge on the proper control of forest exploitation and the proper preservation of this national asset. It is not desired in this report to interfere with the activities of a revised and strengthened Forestry Department in carrying out this policy, and it is recommended, therefore, that all forestry statistics be placed under the control of that Department and that their methods and organization be left completely within its powers. For this reason the Statistical Bureau of the Ministry of Agriculture should give up entirely the handling of forestry statistics and should hand over any figures it possesses and its stocks of Form 23 to the Forestry Department. The Central Statistical Bureau will, however, advise if required on methods and will give any necessary arithmetical assistance in estimation techniques.

After discussion with the forestry specialists a list has been drawn up of heads under which forestry statistics should be organized. This list is included as Exhibit P-7. It is similar to that recommended for Iraq.

It will be remembered that all the work of the collection of these figures will be done by the Forestry Department, some of it, for example areas, in conjunction with the aerial survey recommended. An exception is the provision of statistics of imports and exports, which will be received through the Central Statistical Bureau on the request of the Forestry Department from the Customs Administration, and the figures on the number of forest industries which will be received through the Central Statistical Bureau from the Ministry of National Economy Section after this has taken its Census of Production.

Budget

The cost of the collection of these statistics will fall against the agriculture budget in the Seven Year Plan and not against any specifically statistical funds.

Fisheries

Fish is a valuable and economical foodstuff which is not as widely used as it might be in Iran and of which very few statistics exist. The true catch either in the Caspian or the Persian Gulf is unknown and there has not been a great deal even of scientific research.

Present Position

Fisheries are dealt with by a Department within the Ministry of Agriculture and may be conveniently considered as consisting of:

1. The north coast fisheries
2. The Persian Gulf fisheries
3. The fishing on internal waters.

For 1. the Sheelat Company sends regular annual statistics of its catch and monthly statistics on caviar.

For 2. only the most approximate estimations exist. An agent of the Ministry of Agriculture may, for example, count the number of fishing boats in south coast ports and ask the opinion of various Government and private institutions on the catch.

Fishing on internal waters (3. above) is not important and is difficult to assess.

It may be noted that statistics on the Caspian Fisheries concession are also received by the Department of Concessions and Mines of the Ministry of Finance. These are apparently similar to the figures received by the Ministry of Agriculture, except that the interest is not in tonnage but in profit on which a royalty is paid. It was also stated that in the Concessions and Mines Department there is an estimate of fishery production elsewhere in the country, since many of the fishing rights of the country are apparently leased by the Government.

Recommendations

In the agricultural section of this report it is recommended that the fishery problem be carefully studied in an organized manner and that research be carried out on the fisheries of the country. In particular, the possibility of enlarging the fish catch and improving methods will be studied. It is not possible, therefore, to recommend here more than that the organization engaged on this work should devise a method of obtaining estimates of fish caught which will in turn be sent to the Statistical Department of the Ministry of Agriculture. Such figures should also cover fishing conditions and reserves and their relative importance, the preparation of fish products, marketing, import and export, and so on.

Care should be taken that the figures in regard to the Caspian concession received by the Department of Concessions and Mines do not duplicate those of the Ministry of Agriculture, and that the estimates of fishery production elsewhere agree with the estimates of that Ministry. Liaison should be established through the Central Statistical Bureau.

Budget

This will be covered in the agricultural section of the Plan.

Oil and Minerals

The greatest of all Iran's natural resources is, of course, its vast wealth of oil, and in addition there are indications that there is much mineral wealth of other types. The oil concessions in the south are operated under the single control of the Anglo-Iranian

Oil Company, and in the north plans are being laid for research and development by the Government. The mineral resources have been to a certain degree exploited under a system either of Government operation or of private corporation licensed from the Government. The equipment at the moment is not good and there are many ways in which Iran's mineral wealth could be better exploited. Hence it is important that the statistics in this field be properly developed, and that the output and methods of operation not only of the AIOC but of the mines be clearly known.

Present Situation

Oil Production Statistics

These figures are correctly concentrated in the Department of Concessions and Mines of the Ministry of Finance, who receive at the moment from the Anglo-Iranian Oil Company very detailed statistics on the production, export, labor, internal use and revenue of the Company, and also details on the sales of petroleum products in the country. The last-named is a useful figure from several points of view; for example, it is some indicator of the rate of industrialization and the increase of motor transport. The figures on sales in the country are divided by shahristan so that the municipal tax can be allocated. This tax, which is on the actual selling price, is collected by the Company, which pays it to the Government, which in turn allocates it to the municipalities in proportion to the sales. (This is actually handled by the Department of Indirect Taxation). The Department of Concessions and Mines also hold figures from Iransov Naft, which pays the normal import duty to the customs when its products enter Iran and pays municipal tax on the retail sales through the Ministry of Finance agent to the municipality. This is comparatively smaller.

The above are good and exact statistics, as also are the figures of royalty, which are calculated, as is well known, on several bases.

Mining Statistics

Statistics on mines are maintained by a small statistical sub-section which deals with this subject in the Ministry of National Economy. The Department of Mines in this Ministry is more concerned with public services such as exploration, prospecting and technical control of methods and conditions, particularly in the private mines where technical methods are not always perfect. At the same time the Ministry of Finance in its Department of Concessions and Mines, referred to above, is concerned with the collection of royalty.

The statistical sub-section of the Ministry of National Economy receives from private mines a statement, each quarter, of their production on a special form which is sent out annually. This form shows external construction during the quarter, any roads or Decauville tracks built and so on, underground development during the quarter, the quantity of minerals extracted and the quantity after refining, and details of workers. For each mine a card is maintained and also a file, and the mines are numbered, though these numbers are not self-coding on a special system but merely in the original order of the grant of concessions. The cards do not really deal with annual production in a consecutive fashion and there are no registers. An extraction is made annually of the statistics of total production. Copies of these forms are sent by the Ministry of National Economy to the Ministry of Finance Concessions and Mines Department, which states that owing to the fact that royalty is paid on tonnage there is reluctance to render the returns and even falsifica-

tion. Some check is obtained by the inspectors of the Ministry of National Economy who check production records. There is a joint commission of representatives of the two Ministries which meets regularly to consider matters relating to mines; but the interests of the two Ministries are different, since Finance is interested in the mines as a source of royalty revenue, while National Economy is interested in the extent to which production is being maintained or the natural resources of the country exploited.

Figures on Government mines are handled at the moment by the Industrial Bank and apparently they are only received from it by the Ministry of National Economy as and when required.

Recommendations

1. The statistics on oil received by the Concessions and Mines Department should remain as at present; but full particulars thereof must be supplied by this Department to the Central Statistical Bureau who will in turn give these to the Ministry of National Economy if they are needed therein.

2. From the beginning of the projected northern developments, the statistics on oil prospecting and eventually on production must be provided regularly to the Central Statistical Bureau by the Government corporation which will be established and by the Bureau to the Ministry of National Economy if necessary.

3. The Ministry of National Economy must be regarded as the center for all statistics on the mineral production of the country other than oil and must receive full particulars from the Industrial and Mining Bank on the mines under its control. It is recommended that the mines sub-section, which is already to some extent under the control of the statistical section proper of the Ministry of National Economy, be transferred entirely to that section which as recommended later in this report will be independent of any department in the Ministry and directly under the Under-Secretary. The section should purchase for its mines statistics one Roneodex or Kardex visual card index, in which there will be one tray for each type of mine within which there will be one card for each independent mine. This card should show as at present the name of the mine, the ostan, the shahristan, and so on, the exact location, the name of the concessionaire or its proprietor, details of the exploitation of the concession and its date of expiration, and then a series of columns much more informative than those at present kept, recording from the quarterly returns each capital development and the quarterly production. These will give running total figures which will be extracted, published and sent to the Central Statistical Bureau. Instead of sending copies of their actual returns to the Ministry of Finance a properly-made-up list will be extracted each quarter and sent to that Ministry so that they can check their royalty collection. This may be done direct and not through the Central Statistical Bureau, since it will be a regular routine job. Colored signals will be used on the visual cards to show mines which are producing less than they should, mines which require inspection, and mines which have not rendered a return. Action will be taken regularly on the basis of these colored signals.

It will facilitate matters if the mines are re-allocated numbers in accordance with a logical system whereby the numbers reveal automatically:

The ostan and shahristan

The type of mine

The actual serial number of the mine. Thus 22/5/21 would be a copper mine in shahristan 22 and number 21 in that shahristan.

This card index, when the cards have been printed and details from the existing records entered in pencil, will be properly compiled by a survey of the mines made by actual visits of inspectors to every one, who will render a special form giving concrete details from which the cards can be definitely started.

Figures on mineral production will be regularly provided to the Central Statistical Bureau.

Budget

The small cost of this work will fall against the normal budget of the Ministry of National Economy.

Industry and Commerce

Electric Power

It is obvious that the development of electric power supply in Iran must play an important part in the Seven Year Plan, not only for its general social implications but still more because of the stimulus which plentiful power will give to the development of industry.

Present Position

At present statistics on electric power in Iran are found in a fragmentary condition in a number of places, and do not appear, even when occurring, to be very accurate. There are not many municipally-owned power plants in the country, the majority of generating stations being either private utility companies or the power plant of a factory which in some cases may sell power to a municipality. Of the municipal stations some statistics exist in the Municipalities Department, but these appear to be confined to file records of installed capacity and maximum demand in kilowatts. There are some records of industrial power plants forming part of the statistics of the Ministry of National Economy and the Industrial Bank. The most complete statistics appear to be those in the Ministry of Labor's industrial statistics volume for the year 1326 (1947), but even these are confined to installed capacity, are fragmentary as to coverage, and do not distinguish between mechanical and electric power (though normally it appears they refer to the latter). There is no trace (as far as can be ascertained) anywhere in the statistics of the maintenance of records of kilowatt hours, a lack which is perhaps not quite so important in the case of industrial plants which keep records of fuel on the one hand and their production on the other, as in the case of public utility stations in which the loss in transmission and from other causes may be considerable.

Recommendations

It has been considered logical in this report to treat electric power not as a public utility or a by-product of a municipality but as a major factor in the country's industrial economy. It is recommended, therefore, that the same agency collect data both for stations of the public utility type and for industrial plants with their own generation, and that this agency be the statistical section of the Ministry of National Economy. This is an economical system, for so many factories generate their own power that in taking statistics

about the factories we automatically receive figures of the power. It is important for the Ministry of National Economy to note that this recommendation provides that they be the sole center for electric statistics and means that they will have to widen the scope of the Census of Industrial Production recommended in the next section to include the utility type of power plant.

The principal statistics which should be kept fall under the heads of:

1. Capacity, essentially a capital account
2. Physical operations
3. Demand data
4. Sales data.

Capacity

Statistics of capacity should be rendered annually by all generating stations showing installed capacity, additions to plant during the year, etc. Plants of the utility or municipal type should also show some figures on the distribution system, e.g., installed transformers, miles of line, etc.

Physical Operations

A monthly return should be rendered on the physical operations of each plant, which will necessitate the installation of watt-hour meters in small plants which do not possess them. This return will be of two types:

1. For an industrial plant the return should cover generation, sale to an inter-connected utility system, any purchases from such a utility system, and the internal consumption. These figures are self-checking and self-balancing and an explanation should be given of discrepancies.

2. Plants of utility type should show generation, regular purchases from other sources, interchange purchases, that is, emergency or economy switching of load, interchange sales to other power producers, and in-put into own system. This again is a self-balancing group of figures.

Such plants should also show total sales which by subtraction from the system in-put will give losses. The percentage of losses will, of course, vary with the type of system. For both returns the type of fuel and amount used in the month should be shown.

Demand Data

Certain demand data should be given along with these monthly figures showing the generation at the hour in the month at which it was at its maximum. This would be an average over the hour which is usually obtained by reading the watt-hour meters at the beginning and end of the hour. The figures will also show maximum in-put to the system at the same hour and purchases from or sales to other producers in this hour.

In addition to this monthly return there should be a quarterly return showing for a certain day of the week (say the Wednesday before the spring, summer, autumn and winter solstices) the in-put into the distributor's own system for each hour of the 24 hours. The same day must be chosen for the entire country.

Sales Data

There should also be statistics of sales and revenue, the former in kilowatt-hours monthly, divided by principal classes of business. An important class should be the industrial users served at primary voltage.

In order to maintain these statistics properly the Ministry of National Economy will have to prepare as soon as possible an exact record of all the power plants (which should preferably be mapped) and should maintain the figures on cards in a card index of the Roneodex or Kardex type. These cards will show capacity data above on the visual section, and will be ruled in columns for the recording of the major generation statistics.

Budget

The maintenance of these statistics will involve no extra cost, and the printing of forms and the purchase of a card index should come out of the normal statistical budget of the Ministry of National Economy.

Production

Figures on industrial production in Iran are found in three places, depending on the nature of the industries concerned. This division is the result of the special manner in which industry is organized in the Iranian economy, whereby a large measure of the modern industrialization has been carried out by the Government.

For private factories as well as to some extent for Governmental ones statistics are found in the Ministry of National Economy; for the bulk of the Government factories which are concentrated under the Industrial Bank figures are maintained by that institution; and for those Government factories which are special monoplies of the Ministry of Finance figures are found either in that Ministry or in the factory itself. It can be readily seen that in the reorganization which will be an almost certain consequence of the Seven Year Plan, and with the increase in industrial production which is likely to result, it will be necessary that there should be one plan in which are concentrated the statistics on this important part of the country's economy. There will be a greater demand for good and complete figures as the Plan develops. It will be necessary, for example, to know accurately whether existing factories are operating at a profit or are capable of doing so with more efficient management; to know which are the factories which can readily produce consumer goods in sufficient quantity to absorb purchasing power and reduce the cost of living; and to know in detail the equipment of the factories and their state of repair.

In the present section the statistics of production are dealt with under these heads:

Statistics of private factories in the Ministry of National Economy

Statistics of Government factories under the Industrial Bank and Mining Bank

Statistics of a specimen Government monopoly.

Private Factories

At one time the Ministry of National Economy was responsible for running many of the factories set up during the process of industralizing the country carried out by the late Shah. After some time the Industrial and Mining Bank was created, which took over the factories from the Ministry to operate them at once as a holding company and a bank. The function of the Ministry then became the general development of industry (and of mines—see section thereon), the issue of regulations, the control of commerce and the like.

Present Situation

There are at the moment in the Ministry of National Economy three statistical sections, namely:

1. A central statistical department of about ten persons, which is concerned with the general collection of figures on production but more particularly with commerce, and the work of which in this field is therefore discussed in detail in the Commerce and Distribution section below.
2. A small section dealing with mines, which has been discussed in the Oil and Minerals section above.
3. A small section dealing with factories.

As a result of recommendations made last year the two latter sections are now in close liaison with the central statistical department, which is the channel through which requests for figures pass; but the three sections are still not combined into one and it is, therefore, quite fitting to discuss their work separately. Any recommendations on the statistical organization of the Ministry as a whole are, however, contained in the section on Commerce and Distribution, since it is the last of the three in sequence, and this and the section on Mines and the present section must be read together.

In the small factories sub-section statistics are received mainly from private factories, by means of returns which were instituted when the Ministry of Labor became independent and took with it a number of the factory records. The original questionnaire at the end of 1325 (1946) asked for the amount of production in that year, raw material, a comparative figure for 1319 (1940), number of workers and wages, and so forth. It is open to criticism in that quantity was asked rather than value of production, so that the units vary, and it did not cover the type of machines. Indeed the records of the Ministry of Labor are more complete in this respect. The information was recorded in a register with pages grouped by type of factory.

Figures for Government factories are recorded in a different register and are obtained in many different ways, with the result that they are somewhat incomplete. They do not appear, for example, to cover all the Industrial Bank factories, and in some cases replies seem to have been obtained not through the appropriate Government department but by indirect methods.

In addition to the Ministry of National Economy figures, quite complete records of the production, horsepower and personnel of factories are held by the Ministry of Labor. In both cases factories under 20 workers are omitted.

Recommendations

1. The factories sub-section of the Ministry of National Economy should, like that of mines, be merged completely with the main Ministry of National Economy statistical section, which should become the only center for statistics in the Ministry.
2. As recommended above, under the head Electric Power, statistics on electric power should form part of the records.
3. The records must be made complete for Government factories.

4. Equipment should be purchased for the section, consisting of a visual card index of the Roneodex or Kardex type, and about 3,000 cards with signals and celluloid strips. The design of these cards (of which probably two will be required for each factory) should follow the layout of the Census of Production form recommended, see Exhibit P-8, and the cards should be printed locally. Whenever the Central Statistical Bureau is set up one of its representatives should assist the Ministry of National Economy to design the card, and the Ministry should then enter on it in pencil (so as to allow for alteration) all the records at present held, and so dispense with their registers.

5. A highly important recommendation is that a Census of Production should be put in hand at once. Preliminary discussions should be held with the Ministry of Labor, the Central Statistical Bureau, the Industrial Bank and the departments of the Ministry of Finance which control Government industries, to make sure that the form meets all needs and is practicable. Specimens of the form should then be cyclostyled, and representatives of the provincial offices of the Ministry should visit several factories in their area and try out the form on these factories to ensure—

   a. That factory owners become accustomed to the idea and are not suspicious of any ulterior motive.

   b. That the form is practicable.

   c. That there are no additional points which can be suggested by the management of factories for inclusion.

The census should be taken as at the first day of 1329 (1950) and should cover the factory production for the whole of 1328. In preparation for this census a complete list of factories should be drawn up in consultation with the Ministry of Labor, the Industrial Bank, and so on, and great pains must be taken to insure that this list is as full as possible. The lower limit might be set not at 20 employees but at 10, as in Iran the smaller unit industries are of considerable importance. The census will be taken by the representatives of the Ministry in the provinces and need not, of course, be taken all in one day. In fact, the representatives will visit each factory in turn over a period of two or three weeks and hand out the forms and instruction schedules, discussing the system of completion with the factory management. They will then return after about two weeks, collect the forms and check on the spot that it is properly filled in and that there are no queries or obvious falsehoods. They should extract sufficient information from the forms, before sending them to Tehran, to ensure that satisfactory records exist in the provinces. The returns should be so designed that they are practically self-coding, and after receipt and check by the Ministry of National Economy should be passed to the Central Statistical Bureau, which will punch a series of linked cards from them and carry out all the necessary analysis on its pool of punched card machines.

6. When this census is completed and the analysis performed on punched cards, the basic data will be transferred to the visual card index, which will remain the permanent record of the Ministry, and an equal but less detailed return will be taken annually to maintain it. The Ministry of Labor should then give up the maintenance of any statistics on production other than the one or two bare details necessary to identify the plant, namely, nature of business, horsepower of factory.

7. In the course of taking the census, factories will have been given a serial number, which should be so devised that it indicates at once the area, the

type of factory and its serial number within the area. This number will be notified to the factory, which will show it on all annual returns hereafter.

8. The Census of Production will be applied also to all Government factories, but if the records are adequately kept by the controlling department the returns need not be sent to the factories themselves.

9. The Statistical Commission of the United Nations has recently been considering the question of index numbers of industrial production, on which it has made the following statement:

> "Index numbers of industrial production are essential tools of economic analysis for many countries and for a number of international agencies. The Commission is convinced that a systematic review of the recommendations previously made regarding the scope, content and methodology of such indices should be undertaken with a view of adapting them to new conditions. Such a review should include, for example, a re-definition of the content of groups and sub-groups (and various rearrangements of the sub-groups) of the index in terms of the recommended International Standard Industrial Classification of All Economic Activities. In addition a study should be made of the methodology involved in deriving weighting coefficients for different purposes. Examination of other aspects of statistical methodology should include the possible application of sampling methods or other methods of simplifying the collection of current statistics. It is essential that such studies provide for the comparability of industrial production indices with other general purpose economic series such as wholesale price index numbers and indices of employment. Industrial production indices should also be related to the conceptual framework of national income estimates."

When the Statistical Commission issues full details on the above, the calculation of indices of industrial production should be begun by the Central Statistical Bureau on the basis of information supplied by the Ministry of National Economy.

By the above means a complete and adequate system of production records can be maintained by the Ministry, which should remain the one centre for this work in the country.

Suggested Form for Census of Production

Three points should be noted in Exhibit P 8:

1. Columns read from right to left as in Farsi.

2. A section on the generation of electric power should be added covering the heads Capacity, Physical Operations and so on as recommended under the head Electric Power. It will be a separate return from the rest of the census, and a statement of the machines in the generating stations and of the fuel used will be included in Sections IB and II of the Census of Production proper.

3. In order to make complete the electric power statistics to be maintained by the Ministry, the utility type of power generation must be included in the initial census.

It will be noted that throughout the forms small "boxes" have been inserted for the number of cards on the punched card system and columns for office use. These columns

will be employed for the numerical coding of the information before it is punched on the card. The cards themselves should consist of a series of seven, on each of which there is the same information in the first 16 columns; two columns being devoted to ostans, two to shahristans, three to bakhsh, three to the serial number allotted to the factory, three to its type of work, one to the kind of company and two to the year of establishment. These columns will be punched from the information in the opening part of the schedule, and will be gang-punched on the entire block of cards necessary for recording the information from one factory's schedule. The information on IA will be recorded on one single card, and on IB on one single type of card, of which there may, however, be several for one factory since one card will be necessary for each particular type of machine. The information on II, owing to the number of columns required for quantity and value, will have to be recorded on two cards IIA and IIB, while the information on III will be recorded on one type of card of which there may be as many as six specimens depending on how many different types of staff are employed. This card will have columns for all the headings of the vertical columns in that section of the schedule. Card IV will cover raw materials and V products, and again there will be one card for each particular type used or produced. When the coders examine the forms before punching they will see how many cards of each type are required and enter the number in the "box" in that part of the schedule. These numbers will then be transferred to the "boxes" at the top of the first part of the schedule, and from them the machine supervisor will pick out the appropriate number of cards of each kind, which will be gang-punched and then passed with the schedule through the punching process for the separate punching of each card. The actual designs of cards need not be given in this report, but these have in fact been prepared. The cards for one factory will be linked, not only by the identical information punched on them all, but by a count hole, and by gang-punching all the cards for control purposes with the total number of cards for that factory.

Budget

The cost of purchasing equipment and of printing forms should be carried by the normal revenue of the Ministry of National Economy, and the cost of machining will, of course, be part of the servicing function of the Central Statistical Bureau. No special budget need therefore be allocated, unless it is desired to employ extra personnel for taking the census, in which case these may be budgeted from the industrial part of the Seven Year Plan. This should not, however, prove necessary.

Factories Under the Industrial Bank

At the present moment the Industrial and Mining Bank controls factories of some five types, namely, sugar, textiles, mines, agricultural rendering and chemicals. Some of the factories are not in fact working, nor are all the workers continuously employed. It is clear that the reorganization and increase in productivity of the Industrial and Mining Bank factories will be one of the principal aims of the industrial side of the Seven Year Plan, and for this reason their statistics, and in particular their cost accounting, will have to be of an accurate and complete nature.

Present Situation

The statistics of the Industrial and Mining Bank, despite the fact that they are highly centralized—possibly an undesirable proceeding—were not until very recently on

any elaborately organized system. Figures on production were, however, received from the various factories, though the control appears to have degenerated somewhat as a result of the events of the War. Five forms of various types were used.

Little attention need be paid to the above system, however, for a new and elaborate series of forms has been designed with much ability and energy by the head of the Bank's statistical section, and is now in process of application. Under this system a large number of fairly complex forms has been designed covering five main groups of subjects, namely, workers, health service, social welfare, production proper and the statistics of the Bank headquarters itself.

1. In the first group cards have been designed for each worker, one recording absences and the other hours of work. There are also summary sheets for the work done in the factories.

2. Within the health service series, no less than 16 forms have been drafted covering everything from the treatment of patients in the dispensary during the month to the consumption of food in the factory's clinic. These forms are unquestionably well designed, but might seem rather too detailed for what is, after all, only one facet of the welfare activity of the factory, unless it is remembered that only six are for transmission from the factory to Tehran, the other ten being drafts of the record sheets and so on within the factory. Even then there might be some simplification here.

3. Under the heading of welfare proper an opportunity has been taken to design forms to obtain elaborate statistics, in view of the fact that the social insurance system is more thoroughly applied in the Government factories than in the private ones.

4. The principal forms are, of course, those covering production and the actual working of plants, of which some are applicable to all factories in that they deal with a machine census and with repair shops and costing; others are specific to those factories having power stations; while others, specifically designed for each kind of factory, apply to the import of raw material and production output itself. Similar forms cover the production of Government mines.

5. Finally, there is a group of returns and forms covering the personnel, depots and commercial transactions of the Bank, including tenders, contracts and the like.

The above forms are now in course of test and discussion with factories; their introduction has been sanctioned and will proceed by stages.

Recommendations

1. It is quite clear that the statistics at present available in the Industrial and Mining Bank are insufficient but that the forms designed are if anything more than sufficient. Some compromise must be found between a lack of cost accounting control over the factories, and the over-centralization of records in excessive detail which will cast at once a burden on the factory and on the staff of the Bank and swell the number of redundant employees.

   This consideration is present in the mind of the chief of the statistical section, and it is his intention to use some of the more elaborate forms only as internal factory records, though at first they may be sent to Tehran

to check the application of the system. The aim is, and must be, to have factories on an identical system of personnel, welfare, production and cost accounting statistics, of which the details will be maintained within the plant while simpler summaries are sent to Tehran. This aim should always be kept clear, and some simplification of the forms sent to the Bank might well be introduced from the outset.

The forms have been carefully examined, but it would be out of place here to comment in great detail on the layout, for example, where certain columns in one report duplicate part of another, or on the detailed design and what this implies in the work of consolidation. A great deal of careful and intelligent work has gone into the design of the new system. It is strongly recommended that its adoption, as the background of a proper system of cost accounting in the factories, be proceeded with, a certain degree of simplification being, however, introduced.

2. In general, it may be said that whatever happens to the factories of the Industrial and Mining Bank, that is, whether they are grouped into holding companies, sold to private enterprise or continued on the present system, their records will have to be much more accurate. It is particularly important that all factories should be on a uniform system of records and cost accounting; but the detailed statistical work should be done in the individual mills and be merely analyzed centrally for a group of companies or for the whole Bank. It is only in this way that progress in putting the plants in good order and making them generally productive can be gauged, and to achieve this cost accounting uniformity, the following specific recommendations are made:

   a. A foreign specialist in cost accounting, mechanical accounting, and business records methods should be employed in the Plan Organization in the appropriate industrial section thereof. This man will be qualified as a business statistician and cost accountant. His functions will be (i) to advise on the reorganization of the records of each Government factory under the Industrial and Mining Bank, as a part of the process of their general reorganization; (ii) to organize a cost accounting system in the Tobacco Monopoly, as recommended below under the head Statistics of the Tobacco Monopoly, and to perform similar work for other Government factories not under the Bank; and (iii) to assist the organization of the records of private factories if required. This specialist should be given a two-year contract, and it is estimated that his salary, in order to obtain a man of sufficiently high level and wide experience of all types of industry, must be $10,000 or the equivalent in pound sterling. In addition he will require a local allowance, and his traveling expenses, since he must visit each factory and stay there for some time, will be very considerable. Hence it is necessary to budget Rls. 175,000 for allowances and traveling in the year.

   b. This foreign specialist, acting under the powers of the Plan and with its authority behind him, will work with each factory in turn and lay out a system of statistical records within the factory, with a particular view to cost accounting and the increase of productivity. This he must do, in so far as the Industrial and Mining Bank factories are concerned, in close co-operation with the head of the Bank statistical section, who will control and advise on the statistics within the Bank and its needs.

   c. Each factory will then send summaries and comparatively simple records to the appropriate controlling department of the Government, with copies to the statistical section of the Ministry of National Economy. This last will not only ensure that the statistical section of that Ministry is a central section for production statistics, but that if any

change takes place in the existing set-up, the Ministry is already in possession of full records. Statistics sent by the Industrial and Mining Bank factories must conform to the designs of the head of the Bank's statistical section.

d. This foreign specialist will work in the closest conjunction with the Central Statistical Bureau, but will have no control over the Ministry of National Economy statistical section, his job being to organize the factory records. The Central Statistical Bureau will ensure that the the Ministry of National Economy does not require from the factories anything which might upset the system devised by this cost accountant.

Budget

The estimated budget is $10,000 per annum=Rls. 325,000, plus traveling expenses and allowances of Rls. 175,000. There may also be undetermined costs for printing. Statistical clerks in the factories and in the Industrial and Mining Bank or in any other controlling organization can be found from the present staff without extra employees. The whole of this budget will fall against the industrial section of the Seven Year Plan.

The Tobacco Monopoly

Time did not permit the examination of all of the third type of factory in Iran, that is, Government factories not under the control of the Industrial and Mining Bank but operating as monopolies of the Ministry of Finance. The principal, and certainly the most lucrative, of these is undoubtedly the Tobacco Monopoly and the statistics of this very well-run industry were examined in detail. The general recommendations made may be deemed to apply to all Government factories outside the Industrial and Mining Bank.

Present Situation

The Tobacco Monopoly is a large and well-integrated factory with four production sections, namely, cigarettes, tobacco, nicotine and cigars. It has a number of ancillary services, namely, a carpentry shop, a repair shop, a power plant, a printing shop and box-making plant and so on. The records of such a factory should have two main aspects, namely, production and cost accounting, and there should also be good records from the personnel aspect. In summary, it may be said that the records of each part of the factory are good, but that they are not properly combined as a whole, nor is production related to costs and costs to sales in such a manner as to give good cost accounting or general accounting records.

In cigarette production, a record follows the manufacture step by step from the original in-take of raw tobacco and the warehouse stocks, through the humidifying process, the separation of the leaves, the cutting and the actual manufacture of cigarettes. At each stage there are registers from which a sheet is filled up, and it is possible to ascertain the work done at each stage. A similar system is followed through in the manufacture of tobacco, while for cigars, production by the worker is ascertained and there is a form of cost accounting system. A summary of activities is also produced by the nicotine department.

For the ancillary services there are records of the work of the carpentry department and the printing shop (which has a particularly elaborate system giving a good cost accounting record including overheads and on-costs, but omitting electricity). Similar records

exist for box making, in which there is also a cost accounting system, though the treatment of wastage may require reconsideration; and records exist for the technical stores on a good modern system with a visual card index. The personnel department maintains records and files for the workers and there is a system of health cards. The accounting system is less clear, but it is possible to allocate the expenditure against each worker and to some extent against departments. There is also a fairly full record of raw material purchases and sales. At the time of the visit to the factory a Statistical and Technical Accounts office existed as part of the production side, which dealt with general production, personnel attendance, wage schedules and some elementary cost accounting.

Recommendations

At the time when the factory was first examined it was recommended that a proper statistical section, centralized under the Director, be set up for the whole factory. This would not only receive production statistics from the manufacturing side but would combine these with the statistics of the ancillary services and the personnel and accounts records to give a complete analysis of the factory's activities. It was also recommended that a specialist be called in to combine these records (which are sufficiently good to be ripe for this) into a comparatively complex and accurate cost accounting system. It is understood that a statistical section has now been set up; but while this has resulted in the abolition of the former Statistical and Technical Accounts office, it does not seem to have produced either complete production records or (owing to difficulties in the present accounts system) a proper cost accounting organization. Attention is, however, now being paid to provincial figures on stocks, collection of tobacco, and area under production.

The following recommendations are therefore made:

1. A strong statistical section should exist, not under the Production Manager but, as is now being attempted, under the Managing Director.

2. This section should be advised by the cost accounting specialist in the Plan Organization recommended for Factories Under the Industrial and Mining Bank above. He should make the organization of the Tobacco Monopoly records his first task, since here he has already something good and concrete to work on. His object should be to create a cost accounting system, to which the figures very readily lend themselves.

3. An early task of this specialist will be to examine the Accounts Department proper, as it is believed that it is in this department that the chief stumbling block to a clear and adequate system of cost accounting will be found. He should also pay careful attention to the records of purchase and sales, which appear to be less clear than those of production itself.

4. Attention should particularly be paid to the question of introducing into the factory a machine accounting system, for which tobacco production is particularly well adapted, since its raw materials come in specific units, its production is in specific stages and its final product is readily unitized. Such an installation, if acquired, could greatly extend its work to cover not only production records and accounts, but personnel records, health records, raw material records and the work of the stores section. Thus, in regard to the purchase of bales of tobacco, it might be possible to check at once the stores position, the in-put to the factory and the quality of grading, by punching a card for each bale from the original purchase documents showing the grower, village, serial number, class, grade

and financial details. These cards would be sorted, producing tabulations for accounts, and statistics of the number of bales purchased by class and grade, quality and so on. This would enable bad grading to be traced back to its source.

5. In the examination of the records of the factory, particular attention should be paid to the following points:

   a. The use of work cards for every machine and every worker in the factory.

   b. Simplification, as a result of this, of the present register system.

   c. Statistics from the carpentry department to assist costing.

   d. Inclusion of electricity in the on-cost of the printing department.

   e. The method of handling wastage in the box-making department.

   f. The introduction of bin or tally cards in the technical store, which will promote better physical control of the stock.

   g. Use of a visible card index in the Personnel Department with a card for each worker.

Budget

Any costs in reorganization (with the exception of the cost of the specialist's time) will fall against the Tobacco Monopoly itself.

Commerce and Distribution

Statistics of commerce in Iran exist either in the Bank Melli or in the Statistical Section of the Ministry of National Economy—apart, of course, from such outside bodies as the Tehran Chamber of Commerce. Statistics on distribution are virtually non-existent, and there are almost no tools with which to work in analyzing the distribution system of the country, other than the wholesale price index. There is literally no estimate anywhere of the flow of goods within the country. Yet such statistics will be essential in the economic guidance of the work of the Plan and for the necessary assessment of the impact of the Plan on the consumer.

Present Situation

The statistics of the Bank Melli in regard to wholesale prices, the cost of living, retail prices and the registration of companies are dealt with later (under the head Financial); such other statistics on commerce as exist (distribution figures being non-existent) are found in the Statistical Section of the Ministry of National Economy. This section, besides receiving from the two sub-sections on mines and factories, which have been dealt with above, the figures on mineral and industrial production, receives from various sources a number of statistics on commercial transactions which are in the main secondhand. Thus the section extracts export and import figures from the Customs Bulletin and economic information from the Bank Melli Bulletin. From local Chambers of Commerce the section obtains wholesale prices and it receives the reports of Commercial Attachés abroad. From these and other sources, the Ministry of National Economy publication is made up. It contains economic articles and general graphs.

Recommendations on Ministry of National Economy

1. The Ministry of National Economy Statistical Section requires to be revivified and to take under its control the two sub-sections on factories and mines and organize their production records as recommended in the appropriate sections of the present report. It will also be the center for records on commerce and electrical power.

2. The Ministry of National Economy Statistical Section will then be a center for production and commerce statistics, and should be placed independently under the Under-Secretary of the Ministry. It will require an economically qualified director, young and aggressive, an assistant and eight clerks. The section will publish a quarterly bulletin.

3. This section should construct a complete list of traders, divided into importers and exporters and internal traders. It should examine the whole of the Ministry and make a list of available statistics which it will then take over. It will receive exchange rates, retail prices and wholesale prices from the Bank Melli, but will not duplicate the work of the bank by attempting to collect these itself.

4. The section will make a study of internal trade.

5. The section will receive from the Central Statistical Bureau any figures required from Customs and on communications.

Recommendations on Distribution

In the field of distribution, statistics should be concentrated in the Central Statistical Bureau for the use of the Marketing Section of the Plan Organization. These statistics will be provided to the Ministry of National Economy to make its records complete, and will be of the following types:

1. From the population census, the Plan Organization will require to know for distribution purposes the number of families, age, sex, literacy and religion. This will to some extent bring out the individual buying units and their size.

2. The Central Statistical Bureau will also provide for the Marketing Section the results of the census questions in regard to occupation. It will be necessary for the Bureau to bear in mind distribution needs when dealing with the census department and particularly when arranging questions on the census schedule. If possible, the schedule should show both industry in which employed and occupation. In particular, summaries can be made ranging the inhabitants of the country under skilled, semi-skilled and professional.

3. For distribution purposes, it is also necessary to know income and buying power, so as to find out what market there will be, say, in Isfahan for canned goods. The normal source should be income tax or wage records, but since these are incomplete in Iran it will be necessary for the Central Statistical Bureau, in conjunction with the marketing section of the Plan Organization, to discover income and buying power from such indications as houses wired for electricity, ownership of automobiles and possession of telephones. It may be that homes owning a radio will give an indication of income. Unfortunately such questions cannot be asked in census, for like questions on income they will cause suspicion. It is therefore recommended that the marketing section of the Plan Organization, in conjunction with the Central Statistical Bureau, organize a sample service to obtain information on the lines suggested above.

4. The distribution organization will also require figures on retail trade. These will be derived for it by the Central Statistical Bureau, which for some commodities can obtain the answer very simply by the study of excise figures. For such matters as textiles, however, we cannot take production plus imports, for this does not give distribution since it is a well-known fact that a considerable amount of textiles is in stock. Estimates will have to be made from the tax records of the Ministry of Finance and from actual surveys among merchants, and for comparative purposes the Bank Melli survey taken ten years ago can be employed. The correct method, of course, of obtaining such figures for the retail trade is by a Census of Distribution. In this connection the British Government White Paper Cmd. 6764 (the Report on the Census of Distribution Committee—March 1946) should be studied. In the long run a Census of Distribution must be made an objective. Meanwhile, it is recommended that the Central Statistical Bureau organize a count of retail shops by type, with an estimate of their size, this count to be done by officials going along streets in the principal cities.

5. The statistics on wholesale prices of the Bank Melli should be adequate for the needs of the marketing section of the Plan, but they should be broadened, as recommended below, to cover the whole country. It may be possible for the Central Statistical Bureau to collect the volume of trade in Iran.

6. For distribution purposes, it is also necessary to know the stocks in hand in the country of certain commodities. This is not difficult in regard to stocks in Government silos, for example, and it may also be possible to estimate agricultural stocks from the agricultural estimates to be made by the Ministry of Agriculture, less consumption on farm, leaving a figure which is either sale or stock. Nevertheless, these figures will be very difficult to estimate and it is recommended that the Central Statistical Board make at an early date a special study of this problem.

7. There will be a foreign specialist, it is assumed, in the marketing section of the Plan Organization. It is recommended here that it be his function to organize any market research which is necessary, and for this he will require all the figures listed above from the Central Statistical Bureau, and the assistance of that Bureau in drafting questionnaires, organizing the survey and interpreting the results mathematically. This work will be of service, not only to the economic study of distribution, but to co-operatives, agriculture, and so on, in the country.

Budget

Costs of reorganizing the statistical section of the Ministry of National Economy will be borne by that Ministry. Costs in regard to market research surveys, which will be part of the normal work of the Central Statistical Bureau, will be absorbed in the budget of that organization.

Foreign Trade

The foreign trade statistics of Iran, an important item both in its international economic relations (Balance of Payments) and in planning its internal economy, are accurately and conscientiously compiled within the limit of any faults in the basic data, very complete, and fully published. It must be borne in mind, therefore, when the discussion and criticisms below are read that these figures are among the better statistical data in the Government. Nevertheless, it is possible to recommend means whereby they can be im-

proved both in quality and method; and it is essential that they should be kept up to a very high standard, for they play an important part in many of the statistical compilations discussed elsewhere in this report.

Present Position

The Customs organization consists of small local offices, regional offices and provincial offices. Most of the trade is through the big provincial offices, three of which (Tehran, Bandar Shahpur and Khorram-shahr) handle about 80 per cent of the total.

The system of customs statistics is based primarily, as in all countries, on the declaration made out by the merchant from his invoice. This document shows the station, registration number, date of goods going to Customs, and for each type of goods in the consignment the mark, weight, number (if weight is not applicable), tariff chapter and number value and the calculation of duty and tax. This is scrutinized by a verifier who may alter the valuation, and after further examination an import license is made out. It is after this point, that is, after a double scrutiny, that any error can pass into the statistics as there is no correction in the valuation after this point, though there is a later verification at Tehran the results of which are not apparently passed on to the statistical section.

The question of valuation is, of course, a vexed one in all countries. In Iran the valuation is based originally on documents certified by various authorities in the country of origin, and for imports is a c.i.f. one (cost, insurance and freight). The fixed rate of exchange is adopted. It was stated that most valuations are fairly trustworthy, particularly after they have been checked, but that in the case of goods dutiable ad valorem, there may be undervaluation by the importer to avoid tax. It was also stated in Tehran that all goods are valued c.i.f., but when a visit was made to Khorram-shahr it was found that this was not the case and that to offset the undervaluation of ad valorem goods the value for these was scaled up by the Customs valuers to the wholesale market rate, either in the nearest market or in Tehran. It was stated that this affected only a small percentage of the imports, but in fact it might quite easily become a serious factor as is the case in several adjacent countries. It would seem that the whole of this question requires examination.

When the papers at the Customs post have passed through the cash section and the merchant has received his import permit, the declaration returns to statistical clerks who compile from it a Customs statement which is the basis for the statistics as produced in Tehran. Separate schedules in this statement are made up for import, export, transit, trans-shipment and re-export ex bond. Within the small statistical sections at the ports it is, of course, necessary to enter each individual item before consolidation, and this is done on separate sheets for each country/commodity (tariff number); but when this is added up monthly what is sent to Tehran is only a sub-total for each tariff number/country of origin, showing the type of goods, number, weight, value and duties collected. The date of entry adopted is that of clearance, which is the correct procedure. Goods imported by concessionaires are shown on a separate sheet, but it was understood at Khorram-shahr (perhaps incorrectly) that these figures are also included in the total sheets, so that they have to be subtracted in detail from the latter to give duty-paying imports.

The timing of the transmission of these forms is that in the case of local offices the statements are completed five days before the end of the month, so that in effect for such offices the months are not current months but five days of the previous and 25 days of

the present month. This, however, is unimportant as local offices represent about 1 per cent of the trade. The provincial offices complete their totals to the end of the current month and telegraph these to Tehran on the fifth day of the succeeding month. The full sub-total details must reach Tehran before the 25th of that month. This schedule appears to be fairly well adhered to.

The Tehran office, therefore, receives a large number of separate schedules for commodity/country—it was stated about 6,500 in all. There are about 2,300 tariff items under 22 sections with 87 chapters. A good deal of work at the Tehran office is, of course, saved by having the sub-totaling done at the port of entry, including the numbering and coding of the country of origin or destination. On receipt the entries are transferred to registers of which each covers a certain group of tariff numbers. All these registers are recommenced each year and totals are carried forward by quarters. Consolidations are then made in Tehran and the figures are produced in the customary Customs analysis fashion. The work employs just under 20 staff at Tehran, but it is misleading to consider this to be the only staff employed on statistical work in the Customs since, for example, at Khorram-shahr there are two and sometimes three clerks in the statistical section, with presumably a smaller number at other ports.

The Customs publications are well printed and produced and are published both in French and Persian. There is a monthly publication issued with commendable dispatch which shows in round figures the total imports and exports for every country and the same for the principal items of import and export. There is then a more detailed figure showing for each principal item the import and export by weight and value from and to each country. There is not, however, a detailed cross-analysis by countries. The annual publication is large, detailed and well arranged and written up. It includes, besides a report on the work of the Customs in the period, a series of general tables on the total imports and exports, many graphs, a review of each of the main products, including comparative figures for previous years, a country analysis, an analysis for the concessionaires, and the full detailed tables for all types of movement. There are additional tables for the various ports of entry and exit and a number of statistics on the movement of shipping, aircraft, travelers and road movement.

The Customs Statistical Bureau does not itself compile index numbers, but in the statistics section attached to the Plan Organization some index numbers are calculated though these are really only straight percentages on a 1315 (1936) base.

Recommendations

The Customs Statistical Section of the Ministry of Finance described above is well organized and is one of the best statistical sections in the Iranian Government. Even though there may be deficiencies in the value of trade at the port level, it is certain that there are no further errors made once the figures get into the hands of the Statistical Section. Nevertheless, it is an unsatisfactory system in that all basic consolidation work should be carried out at the port of entry thus preventing detailed check; and certain economic factors operate to cause at least a suspicion of error in the valuations. It is astonishing, however, to find that so good a section carries out the whole of its analyses and consolidations by hand, in registers and on sheets, since it is now an accepted principle all over the world that Customs statistics, like those of the census, must be done with punched card machines. Trade figures are among those most adapted to handling on this

system, since here we have a number of identical basic units of information which have to be analyzed and cross-analyzed in several ways. The following recommendations are therefore made:

1. An installation of punched card machines of 65 or 80 column size should be ordered and installed as soon as possible and the system of handling Customs statistics transferred thereto.

   a. It is advised that the whole system be changed over to punched cards as from the first day of the year 1329 (1950). Since there is a delay in the delivery of this elaborate machinery it is necessary, if the machines are to be installed in time, to order as soon as possible. It is in fact understood that the Customs Statistical Bureau is at present considering tenders for both types of machine. Either would appear suitable for this work for both are widely employed on Customs statistics throughout the world.

   b. The installation should consist of at least 4 hand punches and 4 hand verifiers and an automatic punch together with a sorter and a tabulator. The tabulator should be fitted with a summary card punch or its equivalent. In budgeting a requirement of about 500,000 cards per year should be taken into account, and if possible the machines should be devised to print both Persian and Latin numerals so that the text of both the Persian and the Latin publications can be to some extent run off from the tabulator.

   c. Under this system the Central Statistical Section at Tehran will receive not a summarized total as at present, but a schedule equivalent to the sheets on which the sections at the ports make semi-consolidations, showing each item separately with a reference number, quantity, value, and so on, and country of origin or destination numerically coded as at present. The change-over to this should be extremely simple for the work is really being done as part of the present process, and it should be possible to reduce staff at least at the larger Customs posts. The schedules will be sent up to Tehran on a slightly quicker time table than at present and should be so arranged that, as now, there are separate sets of sheets for imports, exports, and so on; while a method of including the means of entry or exit, for example, road, ship, should be devised. (This may be fairly simple as it is usually determined by the nature of the station). By receiving this itemized schedule, which involves less work at the ports than at present, the Tehran office will be in a position to check any particular item, which it can query if necessary by telegraph.

   At Tehran the schedules will pass, after checking, to the punching section which will punch one card for each item. The card must contain date columns of sufficient clarity to enable an analysis to be made by both the Persian and the Gregorian year, a column to indicate whether the entry is export, import, etc., columns for station, means of exit, reference numbers (which may perhaps consist of the page and serial number of the lines of the original), details of the tariff items, columns for country, a column to indicate whether it is a concessionaire entry and an adequate number of columns for weights in metric tons and value in rials. It may also be desirable to show duties collected. The above is only a suggested lay-out, for the card will have to be specifically designed by the specialist representative of the tabulating machine manufacturer, who must also assist in organizing the system and training the staff.

The cards will pass monthly through the sorter and then through the tabulator to produce commodity/country totals after a primary check-list has been made. It will greatly facilitate the re-analysis of the monthly figures to produce annual tables if a summary card can be produced for the commodity/country total.

d. It should be possible, using this system, to extract not only the grand totals and detail as at present, but also for the monthly publication the detail by countries analyzed by commodities as well as the present detail by commodities analyzed by countries. It should also be found comparatively simple to produce the Farsi publications for the Iranian month and the Iranian year, but the French publication for the Gregorian month and year. This will be done by handling the cards on the brick system, that is, there will actually be 24 consolidations for a year instead of 12. Thus, one "brick" will be the totals for the period 21st March/1st Farvardin to 31st March/11th Farvardin inclusive; another "brick" 1st April/12th Farvardin to 19th April/30th Farvardin; and another 21st April/1st Ordibehesht to 30th April/10th Ordibehesht. To obtain the totals for April, the summary cards for the second and third "bricks" will be tabulated, and to obtain the totals for Farvardin the summary cards for the first and second "bricks". This simple reshuffle will not involve a great deal of extra work if it is done on summary cards, and if the work is kept to an uncomplicated, logical routine it will result in the publication for Iranian use of the figures analyzed in the Iranian way, but for international use of an analysis on the internationally-used year. The latter will be of immense value to the many outside users of Iranian trade statistics—and it will be remembered that trade figures are always produced with international needs in mind.

e. The installation of these machines will have another important effect, namely, the Customs Statistical Section will be able to meet the much greater demands for analyses of their figures which are likely to be made in the future as the Seven Year Plan develops. It will also be remembered that there will be more imports and exports with a consequently greater strain on the existing system.

f. Under the new system more detail must be given in place of the headings of "other countries".

g. The installation of these machines, while in itself expensive, will be found to effect a saving in staff, an increase in speed and a great increase in the flexibility of figure production. In regard to the reduction of staff it seems probable that the personnel detached can readily be absorbed, with their specialized training, by the other expanding statistical sections of the Government; and as such personnel is thrown off an effort should be made to have them so absorbed. It is probable that the male staff will have to be cut down to two or three only at the central office, for experience in all countries has proved that girls are faster and more suited to the work of operating punched card machines than men, partly because their more sensitive touch is less damaging to the delicate machinery, partly because they seem to find routine keyboard work of this nature less irksome.

2. It is recommended that the system of valuing ad valorem goods on the wholesale market rate which was found at Khorram-shahr be abandoned for statistical purposes even though it is retained for the valuation of duty. The whole question of the Customs valuation must in any case be examined carefully; it is often alleged that the valuations are generally untrust-

worthy and while such allegation may be questioned it would be wise for a small commission consisting of one representative of the Customs Statistical Section, one of the Customs Department generally, and one of the Central Statistical Bureau to check a number of valuations on a sample basis at several ports, and report their findings which will be of great value in calculating the Balance of Payments.

3. The Statistical Commission of the United Nations has been for some time considering a revision of the Minimum List of Commodities for International Trade Statistics. It may be well to quote here the statement made in one of the reports of this Commission:

"One of the constant and pressing problems of international statistical comparability is the classification of commodities entering into external trade. There have been many classifications and revisions of classifications proposed during the past half century, but no definite work on a world-wide basis has been done since that of the Committee of Statistical Experts of the League of Nations whose formulation and revisions of the Minimum List were made in the late 1930's. Present conditions require a systematic review of the statistics of world trade. As a first step, the Statistical Commission recommends that a further revision be prepared of the League's Minimum List of Commodities for International Trade Statistics, and that high priority be given to this task. This revision is to be based on the following outline:

a. Crude materials for food, beverages and tobacco manufacturers;

b. Processed materials for food;

c. Food, beverages and tobacco manufactures;

d. Crude materials other than for foods, beverages and tobacco manufactures;

e. Processed materials, inedible;

f. Finished manufactured products, other than food, beverages and tobacco;

g. Special items not included in the classified list.

Such supplementary classifications should be developed as international agencies may feel to be required for use in economic analysis. The Commission recommends that supplementary classifications be developed especially (a) by stage of production (b) by use and (c) by categories of economic activity corresponding to those of the International Standard Industrial Classification of all Economic Activities."

This work is now in hand, and a proposed revision was issued in 1948 (1327). It is recommended that whenever the new Minimum List is issued it should be taken into use instead of the League of Nations List which is employed at present in one of the cross-analyses of the main Customs publication.

4. It is further recommended that index numbers of the value of imports and exports weighted by quantities in a chosen base year, and of quantities weighted by values, be calculated by the appropriate section of the Central Statistical Bureau and published in its Digest or Abstract.

5. It should be insured that ship's stores sold to foreign ships are not included in the Customs figures.

6. The following changes are recommended in the generally very good Customs publications:

   a. Publication of the French version on the Gregorian year and of the Farsi version on the Iranian year as suggested above.

   b. Consideration of whether the foreign language version should not be in English, which is now the principal language of international trade.

   c. It was stated that the country of origin is taken as the country of the last commercial transaction, which is good practice although it sometimes produces curious results, for example, the import of an automobile from Oman. It was stated that when trade-marks, and so on, show the real origin, this is given, but this remark, to judge from the Oman example, is not quite accurate. It is probably, however, better to be consistent and to take the country of last commercial transaction which is, after all, presumably the country which Iran pays.

   d. The miscellaneous items are too big and should be broken up.

   e. The index to the main publication should be made clearer and should include table numbers.

   f. Graphs with varying scales should not be employed.

   g. To add together imports and exports as is done is of dubious utility.

   h. The section on shipping will eventually be dispensed with (see recommendation on Ports Statistics). That on roads is the sort of material which should be published by the Ministry of Roads and Communications and should be omitted here, and that on movement of aircraft should be published as part of the statistics of Civil Aviation. It is also doubtful whether general information such as train times and telephone subscribers is required in a publication such as this.

   i. The general arrangement of the main volume is on the whole satisfactory.

Budget

The total cost or rental of the machines which form the principal item in the recommendations above will, of course, be considerable. It is considered that this expense does not fall against the budget of the Seven Year Plan, but should be absorbed by the revenues of the Customs; and it need not therefore be itemized here.

Transportation and Communications

Railroads

A program of railway construction to close the present main gaps in the Iranian railroad system has been under consideration for some time, and certain major construction works are recommended in this report; moreover the Iranian State Railways as at present constituted are operating under difficulties in regard to such matters as the maintenance of equipment. The proper organization of railway statistics both from the point of view of future estimation and present operation is therefore of importance. In the first field calculations will be necessary of the number of employees set against various estimates

of work and those who are redundant at present and can be taken to the new lines; of the costing statistics for operating cost on lines similar to the new projects; of traffic estimates for new projects, and the like. Under the second head of present operating statistics it is necessary that the railroad should know exactly its revenues from passengers, luggage, goods and so on; its expenditures on maintenance by types of equipment; its traffic expenditures; its running costs on personnel; detailed operating statistics on tons carried, ton kilometers, locomotive kilometers, freight car kilometers, speeds, passengers by classes, passenger kilometers, passenger engine and car kilometers, and fuel consumption; and detailed statistics on the rolling stock. It is the second aspect of the statistics which is discussed here.

Present Situation

The statistics of the Iranian State Railways are detailed and in many ways complete; but the examination made showed that there is much overlapping between sections receiving the returns, and that there is considerable need for reorganization and even mechanization. A railway, if operating at all, attests the existence of adequate statistics, and consequently the adequacy of the present statistics is not in question but rather whether they are superfluous.

The principal sections of the head office of the railway maintaining statistics are:

The Technical Section of the Director's Office

Movements

The Statistical and Research Section.

There are also statistics in Traction and Personnel and, of course, accounts with the Accounts Section.

1. The technical section of the Director's Office receives a number of daily returns, of which the principal is a daily detailed position statement based on telephone reports from each section of the line showing the movement of goods and passenger trains. A copy of this is apparently passed to the Statistical Section of the Division, which consolidates and sends the same data up monthly. The Technical Section also receives returns daily on goods wagons loading and trains moving on the Ahwaz-Tehran line from Movements, which produces these from their daily movements reports, and another return on wagons and work at the Tehran depot which also goes to Movements.

   The Technical Section in addition receives a series of monthly returns, not only the monthly consolidation of its own position statement and a monthly consolidation from Movements of the daily movements report, but a set of returns showing activity at the various stations, expenses, changes in personnel, carriage of goods and movement of trains, fuel oil stocks at the depot, and two statements on personnel, one from the Personnel Section of the Division direct and the other from the Personnel Department, being apparently that department's consolidation of the divisional return. The Technical Section also receives the returns from the ports which are discussed under the section of this report dealing with ports, and has a system of wagon control by means of a board on which arrows are moved to represent wagons. In conjunction with the Statistical Section the Technical Section produces the monthly Bulletin.

2. The Movements Section of the headquarters office receives a daily movement report, from which it passes consolidations on movement of trains and locomotives monthly to the Statisties Section. It receives also copies of some of the Technical Section returns and two elaborate sets of monthly reports from Divisions, covering railcar movements, wagon movements, passenger car movements, locomotive and train movements on the one, and revenue, passenger accidents and so forth on the other. The second set of returns is consolidated by Movements into a register which is not used, a somewhat motiveless proceeding. Movement also receives monthly forms showing the type and quantify of goods loaded.

3. At the same time the Statistical Section of the headquarters office receives a very elaborate monthly movements report or rather group of reports covering the working of rail cars, the movements of goods and passenger trains, the actual working of each engine, passenger movements and the like. It also receives engine and fuel statistics from Traction, statements on fuel and lubricants from the depots, a loading report from the Tehran depot, loading reports from the warehouses and statistics on revenues and exploitation. From these it compiles many derived statistics, for example, passengers by classes, passenger kilometers and so on. It also receives copies of the personnel returns. Copies of some of the statistical returns go to Movements but are apparently not utilized there, and Statistics makes on receipt a number of consolidations which appear to overlap.

4. Further statistics are received by the Traction department on the distance moved by locomotives and their use of fuel oil, on the personnel of this particular department at Division, on repairs, and so on.

5. The normal accounting statistics are received by the Accounts department.

Recommendations

From the examination made and indeed from the summarized statement above a considerable amount of duplication is obvious, particularly between the Technical Section, Movements and Statistics. It would take too long in a report of this nature to indicate exactly the elements of duplication which exist, and indeed it would require a very detailed examination and a comparatively long report to pick out and state the nature of every return in detail, in such a manner as to make quite clear that returns which appear to be duplicates are not in fact merely information copies of another return or essentially different. Nevertheless it is clear that there is a good deal of duplicate effort; and unless the system was not made clear to the writer it would seem, for example, that Movements compiles a locomotive monthly report which it gives to Statistics, which in turn compiles from a different source a statement of the working of each engine in a division which it passes to Movements; that is, the two sections are getting out, from different sources, somewhat similar results which they pass to each other. It would also seem that the main blocks of monthly Movements, returns are very similar to the main block of Statistical monthly returns, and that the copies of the Statistical ones sent to Movements are largely wasted, while the registration of its own returns by the latter section is not used. There seem to be altogether too many personnel figures moving from one section to another, and even on such a special return as the wagons and work at the Tehran depot there appears to be duplication, in that Movements makes a consolidation which it gives to Statistics, and Statistics receives the original return and makes another consolidation itself. It may be that some of the above points are not correctly stated, but there is certainly clear evidence of too much detailed paper work and too many redundant figures.

Without expanding the present report to great size it is not possible to make specific recommendations here on the cancellation of return X and of the utilization of return Y to replace both X and some other return Z. It would appear that the best way in which to tackle the problem is to treat it broadly and to cut through the jungle of returns by drastic reorganization. The following recommendations are therefore made:

1. The statistical work of the Technical Section of the Director's Office and the Statistical Section proper should be combined into one statistical section attached to the Director's Office. This will immediately eliminate a great deal of duplication.

2. This new section should be empowered to examine in the greatest detail over a period of months the statistical operations of all departments of the railway, should build up a representative card index by subject of all railway returns, and should use the Director's powers to cancel all duplicate returns. This may involve a considerable reduction in the number of statistical returns received by the Movements Section and the limiting of its functions to more purely movement operations.

3. The new statistical section should be the center of all statistical as distinct from accounting work, but should also receive summaries of operating accounts from the Accounts section and copies of the monthly movement statistics from Movements. The distinction between this section and Movements should be that the latter handles quick operational statistics and the former all statistics requiring analysis or of a long-term nature, that is, statistics necessary for the general direction of the railway. The distinction between the statistical section and Accounts should be that Accounts retain all statistics on expenditure and revenue and provide these to the Statistical Section, which should not touch this field. The aim should be that all statistics should come to the Statistical Section from the statistical part of the divisional office except those figures specifically connected with the specialized subjects of ports, traction, fuel control, the Tehran depot, personnel, accounts and quick movements, which will come from their own opposite number or the basic source to Tehran and be handled by their own department there. In summarized form they will then be presented to the Statistical Section.

4. If the Director's Office requires daily operating statistics of a nature that cannot be obtained from Movements, this will continue, but must be kept separate from the monthly work.

5. The Accounts department should distinguish between operating and capital accounts.

6. It is doubtful whether details on individual cars are of any value, and this is a matter for investigation. It may be found, for example, that as the railway expands a centralized wagon control system becomes impracticable.

7. An early and detailed study of the railway statistics should be made either by a punched card or other mechanical accounting specialist, together with a suitably qualified member of the Central Statistical Bureau, to ascertain whether a machine accounting system centralizing both accounts and statistics can be applied to the railway (as is normally found very convenient). Such an investigation would have occupied the writer too long and is in any case beyond the scope of this report.

Budget

The recommendations made should in the main result in savings and not in extra expenditure, but if punched card or other accounting machines are adopted the special expenditure will have to fall against the railway part of the Plan budget.

Highways and Road Transport

From the statistical point of view this subject falls into two parts:

1. Statistics relating to the highway system of the country—lengths of roads, construction figures and the like—which are necessary in the proper development of the road program.
2. Statistics such as those provided by a traffic census which give a general impression of the weight of traffic throughout the country and of the extent to which road transport is utilized.

The road program recommended, as will be seen elsewhere, is extensive. In view of the large expenditures involved it is clearly desirable at an early stage in the execution of this program to have exact and complete statistics, not only on the actual construction of the roads but on the load they will be obliged to bear. These figures also play an important part in the assessment of the linking of one part of the country's economy to another.

Present Position

At the present moment the Roads Department of the Ministry of Roads and Communications has a number of statistics, which are, however, practically confined to construction and maintenance. The department lacks staff and funds to have proper statistics of the roads and, indeed, in view of the difficulties of the terrain has to strain all its efforts on the amount of construction which it is at present doing. The Department does, in fact, receive returns from the provinces on the various road works undertaken, for example, construction, cubic meters of earth fillings and number of workers, and it was stated that they annually make out statistics on these subjects. They also hold total figures for the country of the lengths of roads by types and the number of bridges, though the smaller bridges are not planned and are known by numbers only. It is thought that the figures held may be exact for new construction but that the plans of existing roads are by no means complete, and it is acknowledged that repair statistics are not exact, nor are there adequate statistics on the manpower employed.

No statistics exist on the weight of traffic in Iran. As far as vehicle registration is concerned, while there are, of course, statistics in the Police Department relating to this subject, there is a serious lack of figures in regard to the operation of public conveyances and of commercial trucks.

Recommendations

Highway Statistics

It should be possible to allocate workers to each highway division in accordance with its mileage, and therefore exact statistics will be required on personnel and on the mileage of roads. It is therefore recommended that proper attention be paid to obtaining complete statistics in these two fields.

Traffic Census

It is recommended that an early traffic census of the country be taken in order that the traffic on roads and the load carried by commercial vehicles can be gauged. This census should be co-ordinated by the Central Statistical Bureau, but it will be carried out by the gendarmerie and police and will be, in fact, taken for the benefit of the Roads Department, who will receive the complete figures and will do the actual organization of the census. It is desired to emphasize that a large organization need not be created for this purpose and that the census should not cover the entire road network of the country but only spot sections of the principal primary highways. It should be decided beforehand whether flocks and herds and draught animals going into the fields and such minor items as bicycles should be included, while pedestrians should certainly be omitted.

For the purpose of this census, gendarmes or other enumerators should be stationed at chosen points along the principal roads, each being equipped with a pad of forms, see Exhibit P-9, a board and clip for convenience in writing and an adequate number of pencils. He should have cover from the sun and rain. The census should be taken not on one day but on several chosen days at short intervals, each being a different day of the week. Certain hours of the day for example, a period in the morning and a period in the late afternoon, should be chosen and a test should be made on one or two roads, first to determine the practicability of the arrangements. A consolidation system should be arranged jointly between the Central Statistical Bureau and the Roads Department, and it should be decided whether merely straightforward totals are required showing the traffic of various types (a) vehicular and (b) other, in each direction, or whether there should be a certain degree of statistical technique applied. On this the advice of the specialists in the Central Statistical Bureau should be taken. It is further recommended that a special traffic study should be made on all the streets of Tehran in the near future with special reference to the bus reorganization referred to below.

Budget

Any extra costs in the derivation of the above statistics, and in particular the cost of a traffic census, should be met from the budget allocated to Highways (the second item of Chapter II of the Plan Act). No special statistical allocation need therefore be made.

Shipping and Ports

Iranian ports will obviously play an important part in the Seven Year Plan, and it is clear that they will have to take a very considerable load; moreover, the improvement of existing port facilities is an integral part of the Plan itself. It is therefore essential to have good and early statistics on shipping entering and leaving the principal ports and to maintain these on a regular and continuing system.

Present Position

At present statistics on ports are found in three places:

1. The Iran State Railways, which controls at the moment Khorram-shahr, Bandar Shahpur and Bandar Shah, receives monthly from each port two returns, one showing loading, the other unloading. Each return shows for each ship the date and hour of arrival, registered tonnage, and so on, national register, number of days in port and port dues collected. The two

returns really differ only in the respect that one shows the number of tons unloaded and type of cargo, and the other the number of tons loaded and type of cargo. It would seem that some rationalization of these forms could already have been achieved. A further return is sent showing repairs effected on local vessels.

2. The Customs Adminstration obtains a number of figures on the operation of the ports which is at present its responsibility. These are printed with a very complete analysis in Section XXIV of the annual Customs publication and show for each port the number of ships entering and leaving of each flag, and the type of ship, as well as their net tonnage and crew, and the amount of cargo loaded or unloaded. Very frequently, of course, the shipping leaving is exactly the same as the shipping entering, so that the two distinct tables given are very nearly a duplication. Various summaries are made.

3. In the small Ports Department certain other statistics exist. When this department was visited it was found that it received a copy of the railway return for Bandar Shahpur but not for the other two ports. Its own statistics chiefly center around Pahlevi and Naushar which the department directly controls, and from the former they receive reports on each ship and lists of passengers' names, cargo and so on. The department also receives hydrographic statistics from Pahlevi which appear to be of a satisfactory nature.

Recommendations

It is considered that a new series of returns should be designed to cover the shipping entering and leaving ports and the cargo, of such a nature that it will not only be adequate for the present but also suitable for continuation, if and when the ports come under a proper port authority. These statistics must start from the shipping itself that is, from the visit of the port officer, who maintains a book in which he records details of the ship's manifest, time of arrival, and so forth.

The returns recommended are of three types:

1. A Monthly Ship Return will be rendered to the controlling authority, which will show on one sheet the ships entering or leaving the port with the date and time of arrival or sailing, their draught on entering and leaving, the master's name, net registered tonnage, particulars of manifest cargo, name of owner or agent, port of registration, port from which arriving and particulars of cargo loaded. This return if well designed can probably cover both incoming and outgoing ships, as normally a ship which enters will also leave; a ship which enters the port towards the end of the month and leaves in the next month will have to appear on two months' returns with a special marking. On the other hand, if it is thought that the benefits of showing only once those particulars which do not change, such as master's name, net registered tonnage, etc., are not sufficient to out-weigh the greater ease of having two forms (one for incoming and one for outgoing), the latter system may be adopted. What is essential is that the particulars indicated above should be recorded, while the cargo if possible should be divided between commercial, Governmental and Oil Company.

2. There should be Daily Working Sheets maintained in a book with a page for every day which will be sent complete to the controlling authority at the end of the month. On this the ship will be referred to only by name

without any of the details given in the monthly return, and against the column of ships' names there will be for each day columns showing berth, time of starting work, number of gangs employed over side, number of gangs working on shore, time of finishing work, tonnage unloaded and description of cargo. For loading there will be similar data but in a different book. There seems to be a paucity of statistics on export loading, perhaps because loading is usually in stream. The daily figures given will, of course, be to some extent an estimate, and the last day's loading or unloading for any particular ship will probably have to be adjusted so that the total cargo loaded or unloaded agrees with the manifest total.

3. There should also be a Daily Delivery Return summarized from tally cards in the port officer's office, which will show how much has been delivered to road, rail and water transport.

It is recommended that this new system of returns not be introduced all at once, but that the following stages of putting into effect be adopted:

Stage 1. Adoption of system at Khorram-shahr, Bandar Shahpur and Bandar Shah if and when the railway takes over full control of these ports. The present railway returns will then be cancelled and the Customs can, if they wish, receive a copy of return No. 1. Copies of all returns will be sent to the Ports Department.

Stage 2. The Ports Department will continue with its present returns at Pahlevi and Naushar until a proper authority is set up, when the system can be applied to these ports by that authority.

Stage 3. At the same time the system can be extended to cover all the Oil Company ports.

Stage 4. All other ports at present under the Customs Administration will continue with their present system until they too are brought under a port authority when the new system will be adopted.

It is recommended that the hydrographic records continue until the port authority has its own marine department, when it can take over the records. It should be noted that records will be required for the Balance of Payments calculations, recommended elsewhere in this report, of the fuel, food and water purchased in Iranian ports by foreign vessels.

Budget

The cost of providing these statistics will clearly be small and should be absorbed by the appropriate authority when it is set up.

Aviation

Present Position

The Department of Civil Aviation is a comparatively recent creation and is in the process of building up its system of statistics. Publication of civil aviation statistics is made at present in the annual Customs volume, where considerable detail is given on the work of Iranian airways, their rates, and so on, and on ticket prices of a number of foreign companies, followed by a table showing for the principal aerodromes of Mehr-abad, Abadan and Kermanshah, the number of aircraft entering and leaving, the type of aircraft, the country of registration, the quantity of merchandise imported or exported, the number of travelers entering and leaving, and the country from which arrived and for which de-

parted. The figures for number of aircraft very nearly agree on the Entry and Departure tables, and to that extent there is an element of duplication; but the quantities of merchandise, the number of passengers, and the country of origin or destination, are naturally different in the two tables. The figures are for the year only. These figures apparently relate only to aircraft going out of or entering Iran and not to internal traffic.

Recommendations

1. Much fuller statistics should be published on the internal air transport of the country. These statistics can be readily compiled by the Department of Civil Aviation from records supplied by Iranian airways and the Anglo-Iranian Oil Company. Miscellaneous flights and private flights will be obtained from airport records.

2. The aim of the Department of Civil Aviation should be to build up a system of statistics on the following lines:

   a. Operation of domestic companies within the country.

   b. Operation of domestic companies outside the country.

   c. Operation of foreign companies whose aircraft enter and leave the country. Statistics of both traffic, that is, number of flights, and transport, that is, number of passengers and freight, must be collected. For the long distance flights, not only must the next airport of call be known, but the eventual destination; for example, a B.O.A.C. plane may leave for Nicosia, but its real destination is London.

For each of the principal airports in the country the Department should know the following details:

   a. Regular services.
      i. Iranian planes.
      ii. Foreign planes.

   b. Special services, for example, charter, Anglo-Iranian Oil Company services, and so on.

   c. Private flights.
      i. Business.
      ii. Pleasure.

   d. Training flights.

   e. Military flights.

Here again the statistics will be divided between traffic and transport.

3. Such statistics should be published in a leaflet by the Civil Aviation Department and not in the Customs publication. They should be supplied regularly by the Department to the Central Statistical Bureau for publication in the monthly Digest and annual Abstract.

4. As a guide to the layout of international civil aviation statistics, reference should be made to the finad report of the Statistics Division of I.C.A.O., which is published as I.C.A.O. document 5205 Sta/526.

Budget

The cost of compiling these statistics, like that of the air survey to produce I.C.A.O. maps referred to in the section of this report under cartographic survey, must fall against the budget for civil aviation development.

Posts and Telecommunications

The reorganization of postal services and the improvement of the present limited telephone and telegraph system is an integral part of the Plan, and consequently it is necessary to refer briefly here to the statistics of this somewhat specialized field.

Present Situation

The Ministry of Posts and Telegraphs has already correctly centralized its statistical work in one bureau which publishes an annual report, the layout of which has been standardized from year to year. The statistics maintained and published by the bureau cover the organization of the Ministry and the number of its employees (obtained from the Personnel Department, which maintains the usual records), the number of post offices, changes in postal transport (from the appropriate section), transfers of cash by money order, details of postal tariffs, actual statistics of domestic and foreign mail carried, some statement of telegraphic equipment, and the budget.

Apart from the specialized figures in the above fairly complete coverage, which are received from the appropriate department, there are two main statistical sources:

1. An annual form showing the equipment of the various postal bureaus, and
2. Returns from central post offices showing the running statistics of mail carried.

For those matters which are regularly registered, such as registered letters, parcels and telegrams, figures are sent monthly, but for unregistered letters a sample is taken on a 28-day period and multiplied to give an annual total for the country. Foreign mail is handled similarly. There is also some record for the telephonic equipment taken over by the Ministry from war materials.

Recommendations

Postal Statistics

The postal statistics at the moment appear to be adequate, though no test was made of their accuracy. They are in the main in accordance with international practice. It is not necessary, therefore, to make any recommendation for their alteration, but it is considered that the postal expert whose assistance is recommended elsewhere in this report should consider whether the methods are as up-to-date and effective as they should be and if necessary recommend alterations. He may desire, for example, to recommend postal censuses more frequently at first, in order to ascertain the load on provincial offices.

Telecommunications

It is necessary to be more specific in this field, for here changes are of high priority. In the communication section of this report a number of basic studies are recommended, of which two are outstanding statistical importance:

1. It is desired here to endorse the recommendation for a commercial survey of the principal cities in the entire country, to be made with a view to evaluating the communications service required. There is at the present moment no means of even guessing with any accuracy what the telephonic and telegraphic load will be in the future. The survey required will be an examination of the economy of the principal cities with a view to forecasting the trends of their population growth and their commercial development; for such a survey it will be necessary to know population figures, birth rates, cost of living, family budget particulars, total production and commercial trends. The commercial survey is, in fact, an economic survey adapted to proving what the growth of the town will be and therefore assessing its communication demands.

   This survey must be carried out at an early stage in the Plan by the respective administrations (Government and private) for telegraphs and telephones; but since both will require the same basic economic information this must be derived for them by the Central Statistical Bureau, and on no account must the administrations address themselves indiscriminately to various ministries to obtain figures, which may possibly be inaccurate as the result of an imperfect understanding of the problem. It may be that the information which the Central Statistical Bureau can get together will not be enough for the needs of the administrations, in which case they themselves may require to make on-the-spot surveys in some cities; but these must not be attempted without prior consultation and co-operation with the Central Statistical Bureau.

   Positive action on this recommendation must, therefore, begin with a conference between representatives of the administrations, any foreign advisers engaged, and the Central Statistical Bureau, to decide how much information can be supplied by the Bureau and how much can be derived direct, and to plan a scheme of action for the taking of this commercial survey.

2. A second early priority on which action must be taken by the administrations concerned is a point to point traffic study. While the commercial survey is intended to evaluate future traffic, this study is for the purpose of ascertaining accurately the present telegraphic and telephonic load. It is strongly recommended, therefore, that from the initiation of the Seven Year Plan schemes in this field both the telegraph and telephone administrations should keep accurate records. These will show the number of calls (or telegraph messages) between each pair of cities, the duration of the calls in minutes (or the number of words in messages), and similar data. These records are required to find out how much circuit time is being taken up, the size of the circuit groups necessary, and the points between which direct traffic is justified or where traffic should be switched because of low volume.

   In addition to the two studies above, it is recommended that both the telegraph and telephone administrations institute a more rigid accounting system so that in effect they have a cost history of their operations.

Budget

Any extra costs in taking the above surveys will be borne by the communications budget of the Plan.

FINANCIAL

The National Income

The National Income of a country requires an extremely wide range of statistical information for its calculation, and is in itself a difficult and complicated concept. It is usual to define National Income in general terms as equal to the value of the goods and services produced during the year by the individuals who constitute the nation, these individuals being defined as the group of persons legally resident in the country, and the value of the goods and services being expressed in money terms. There are three facets of this concept, namely, income, expenditure, and output, and it is usual in countries with an advanced statistical machine to calculate the National Income on all three bases. Each of the facets of this income/expenditure/output concept may be defined separately.

On the first basis we may define the National Income as the aggregate of the incomes of the persons composing the nation, income in this connection being the money a person receives after he has paid the expenses of the business, trade, and so on, from which he earned it. This is perhaps the simplest of the three concepts. Such incomes may arise from the ownership of property, or from work, or from public authorities, but capital gifts will be excluded. The total should include the undistributed profits of companies to give the whole income of the private sector of the economy. It will be noted, however, that since such a calculation of the National Income includes taxes paid to public authorities and also income received as pensions, and so forth, from the Government, there is some duplication.

The National Income may also be defined and calculated by considering the manner in which these personal incomes are spent. The concept here is one of personal outlay, and the expenditure of all the persons composing the nation can be very clearly divided between expenditure on consumer goods and services, direct taxation, and a residue which is savings and forms an addition to personal wealth.

The third concept of the National Income is that of the national output, that is, the annual value of all goods and services produced by the inhabitants of a country. As stated in the British White Paper on the Sources of War Finance and National Income, 1938 to 1944 (Cmd. 6623), the net national product is also derivable from tables on the National Income calculated in the other two ways defined above. The figures of net national product will exclude sums allowed for depreciation and maintenance and will be at factor cost, that is, will represent the actual remuneration of the factors of production employed in producing goods and services. They must therefore exclude indirect taxes. If we take gross national product we include sums for depreciation and maintenance, and if we take gross national product at market value we include also indirect taxes.

In sum, we must bear in mind that whether we calculate the National Income as an aggregate of personal incomes, or as an analysis of personal expenditure, taxation and saving, or as the sum of the national product, whether net or gross or at factor cost, the general definition of the National Income given by Colin Clark is the core round which the

three concepts are built, namely: "The National Income may be defined for any period as those goods and services which flow into being during that period which are customarily exchanged for money, avoiding, of course, double reckoning of those goods and services which are produced at one stage and then used up again in another stage of the productive process. We require a net total of the value of goods and services available for consumption or investment." Later he adds, "The money measurement of the national income will comprise, therefore, all goods and services provided by capitalist enterprise, reckoned at the prices at which they are actually sold. Of the services provided by public enterprise, those which are sold in the market (for example, postal services, municipal trading services) will similarly be reckoned in at the prices at which they are actually sold; others, such as public health services or free education, must be reckoned in at cost price. This will represent the value of materials used, the wages and salaries paid to public servants, and the interest on capital borrowed by the State or municipality for the purpose of these services."

Present Situation

Some study of the possibility of calculating the National Income of Iran has already been made by the Bank Melli, an official of which made a special study of the subject in Britain and thereafter in this country. The possibility was examined of calculating personal incomes from income tax records, various records of agricultural and other taxes, former rent taxes, and so on, and from such indirect taxes as the excise. To obtain the National Income from the expenditure angle, statistics not at present available would be required, and to calculate it from the national product point of view we should require the output of all the factories, cost, and so on, and estimates of depreciation which, strictly speaking, should be available from income tax records.

Iran has perhaps not yet reached the stage of statistical development in which the National Income can be calculated. There is little use in calculating the National Income by totaling personal incomes unless we know how these are being spent, and unless we can analyze the national product. To decide which of the concepts should be given the most importance we must consider the object of the calculation, that is, whether it is desired to re-distribute wealth through taxation, to control consumption by means of rationing and subsidies, to assess the general wealth of the nation, to alter the layout of the consumption structure, or to calculate income per capita.

Despite the difficulties, the Bank Melli made a general estimate of the National Income of the country, but in so doing advocated that this should be treated with great caution and regarded as extremely general. This view is endorsed, not because of any inherent fault in the particular calculation itself, but because the lack of statistics, coupled with the fact that it does not seem to have been clearly laid down for what purpose the National Income calculation will be required, make it nearly impossible at the moment to attempt proper calculation.

Recommendations

The following recommendations are therefore made:

1. The calculation of the National Income of Iran should be postponed for some time until the principal statistical needs have been met. This

involves the carrying out of practically all the major projects envisaged in this report, that is,

Census of population, including occupations

Census of production

Census of agriculture or at least good production figures

Good figures on laborers below the income tax level and their wages

Good income tax figures

Distribution statistics.

2. Attention is directed to the pamphlets on the National Income of the United Kingdom which have been published in the leaflets by H. M. Stationery Office (Cmd. 6623, 6784, 7099 and 7649). The best-known text-book on the subject is probably Colin Clark's National Income and Outlay referred to above, which is of later date than the major works of Bowley and Stamp. Bowley's Studies in the National Income (1938) contains a valuable bibliography. Another recent work by two acknowledged experts is that of J. E. Meade and R. Stone, National Income and Expenditure, which was published in 1948. Reference should also be made to the report of the sub-committee on National Income Statistics of the League of Nations Commission of Statistical Experts, which was compiled by Mr. Stone under the title of Measurement of the National Income and the Construction of Social Accounts, published in Geneva in 1947 as United Nations Studies and Reports 7.1947.II.6.

3. Almost the only calculation of the National Income in the Middle East is that made for Palestine, which should be studied as a working model. Three publications exist:

National Income and Outlay—Palestine 1936
By Ludwig Gruenbaum (1941);

Survey of National Income of Palestine
By G. E. Wood (1943);

National Income of Palestine 1944
By P. J. Loftus (1946).

The pamphlet of Mr. Loftus is a clear guide to the method of handling a calculation of the national output in a Middle East country and should be examined closely.

Budget

Nil.

The Balance of Payments

Since the Balance of Payments is of major importance in determining a country's financial position as a whole in regard to its outside contacts, and since the concept is a fairly complex one and the details still more so, it seems desirable to preface this Section with a short discussion of the general theory of the Balance of Payments.

All main economic contacts between countries involve money payments either between individuals or Governments. The Balance of Payments of a country is the statement of these payments. In actual practice four distinct calculations can be defined. The

first is the Balance of Trade, which concerns the value of a country's imports set against that of her exports, that is, commodity exports minus commodity imports. The Balance of Trade is, of course, only a part of the Balance of Payments, and may in itself be misleading if care is not taken to define whether, for example, imports are c.i.f., or, as with Canada, U.S.A. and South Africa, f.o.b. port of export. A country's Balance of Trade need not balance and it is not necessarily a bad thing for it to be adverse. Secondly, the Balance of Trade is made into a complete picture by taking into account the services rendered to or by the country, its payments to or from foreigners for shipping, interest, insurance, tourist movements, and so on. This is the Balance of Payments proper. A third calculation may be made, namely, the Balance of Payments on Current Account, showing the balance of actual payments made to or by the country for all current purposes. This will include payments resulting from the purchase of its goods, shipping, services, and so on, in other words, receipts omitting borrowing and foreign repayments, minus all contra payments to foreigners (omitting lending and so on). The total will show the amount available for the country to lend abroad or use to reduce its indebtedness to foreigners, or vice versa. Finally, the League of Nations Statistical Office also included in their picture the Balance of International Indebtedness, which is in effect an Assets and Liabilities balance sheet at a particular date.

The principal items in the classical Balance of Payments in such countries as the United States are set out below. It will be remembered that for every item in the following list there is both a credit and a debit (export and import). Thus we have:

Trade and service items:

- Merchandise
- Adjustments (for sale of ships, bunker fuel, smuggling, and over- or under-valuation)
- Freight and shipping
- Tourist expenditure
- Immigrant or emigrant remittances
- Contributions, charitable, educational, and so on
- Interest and dividends
- Government transactions
- Miscellaneous services (includes film royalties, taxes, fees and commissions, insurance payments)

Gold and silver:

- Gold exports and imports
- Silver

Capital items:

- Long-term capital movements
- Movement of short-term banking funds

This brings us to the difficult question of the movement of short-term funds, which is a semi-residual item in that it finally balances the Balance of Payments (the real residual item only represents the extent of inaccuracies or time lag). When we add the Current

Account (non capital) and long-term capital parts of the Balance of Payments, we find that the country has, perhaps, a credit on the whole, that is, it has some free income which can be used either to raise its balances abroad or for similar increases in short-term capital abroad. If the classical Balance of Payments is to balance, rises in short-term capital abroad must be shown as a debit item in order to balance the statement. Reductions will be on the credit side. This is at first not very clear unless we remember that in making up a Balance of Payments statement, all imports are shown as debit items, while all exports are shown as credit items. Every import of goods or services involves a corresponding export of money sooner or later; similarly, every export of goods or services involves a corresponding import of money. Thus for every import of Rls. 1,000 (in goods or services) entered on the debit side, there must be a corresponding export of Rls. 1,000 (money) entered on the credit side, and vice versa. A country, therefore, never in theory shows an adverse balance on the Balance of Payments. For example, let us suppose that over a given period Iran's exports were Rls. 1,000 worth of goods and imports Rls. 2,000 worth of goods. The Balance of Payments would show this as follows:

	Rials Credit (Export)	Rials Debit (Import)
Goods	1,000 (1a)	2,000 (2a)
Money	2,000 (1b)	1,000 (2b)
	3,000	3,000

The real significance of the Balance of Payments lies, not in the total, but in the balancing item, which represents the difference, over the period, between all the rises and falls in the country's foreign exchange holdings (the net of all the movements). In the above instance there has been only one movement each way. The balancing item is, therefore, the difference between 1b and 2b, that is, Rls. 1,000 on the credit side, which balances the debit caused by a Rls. 1,000 excess of imports over exports, and which corresponds to the net reduction in foreign balances (short-term capital abroad) involved.

If Iran had exported Rls. 2,000 of goods and imported only Rls. 1,000 of goods, the balancing item would have been Rls. 1,000 on the debit side, corresponding to a Rls. 1,000 rise in foreign balances.

What are the aims of a Balance of Payments? In brief, they are:

1. To find from the residual figure whether we are incurring foreign liabilities by loans, eating up our balances of foreign currency or improving them, how much we can lend or must receive abroad, and why;
2. To alter the exchange rate;
3. To find whether the levels of money income must be depressed or raised;
4. To find whether other forms of control are necessary.

Present Position

In view of the importance which is attached to a proper calculation of Iran's Balance of Payments, the Bank Melli formed in 1327 (1948) a small commission to consider a system of calculation, of which the statistical specialist of OCI was a mem-

ber and to which he acted as technical adviser. The main purpose of the meetings held was to draw up a detailed scheme for the production of Iran's Balance of Payments and in particular to interpret the application of the International Monetary Fund's recent Balance of Payments Manual to Iran. This Manual goes much further than the original League of Nations Balance of Payments scheme, which is now in use by several countries and which is based on the classical lines given above. The I.M.F. scheme differs from this in three important respects:

1. The movement of capital forming the second half of the Balance of Payments contains both short and long-term capital and the former is not treated as a balancing item. Capital movements are treated as rises and falls in assets and liabilities, and a rise in assets, for example long-term capital held abroad, is regarded as a plus—a reversal of the classical Balance of Payments procedure in which a rise in assets held abroad is regarded as a minus to balance receipts on the other side. In effect on the I.M.F. system the total net on the current account will be the same as the total net on the capital account and with the same sign, + + or − −. The two cannot therefore be added together to balance each other out but must simply be equated, the capital half showing in effect how the deficit or surplus on the current half was financed.

2. Not only are international gold movements taken into account, but gold sold by the Central Bank within the country is regarded as lost to the country and is included. As stated on page 27 of the paper, "The fact that gold production may be sold to the Central Bank rather than to foreigners does not make it any less a Balance of Payments factor since gold sold to the Central Bank by residents creates foreign exchange or its equivalent as effectively as if it were sold to foreigners. Similarly, gold drawn from the Central Bank for domestic consumption uses up foreign exchange or its equivalent as effectively as if the exchange were spent on imports from foreigners."

3. The Manual appears to prefer the valuation of imports f.o.b. port of export, which is in accordance with the American system. It is not, however, categorical on this point and is designed throughout to allow for either method of valuation.

The conclusions come to by this commission have been embodied in a very detailed paper which was presented some months ago to the Bank Melli. In this paper each paragraph and section of the International Monetary Fund's pamphlet has been considered from the point of view of its application to Iran and of the Iranian statistical machine's capacity to produce the necessary figures; various adjustments have been made and a coherent scheme drawn up. A Balance of Payments was then produced by the Bank Melli to cover 1325 and 1326 (1946 and 1947). In this an attempt was made as far as possible to follow the instructions given in the I.M.F. Manual, but owing to the time factor it was impossible to work on the complete detailed scheme given in the special paper referred to above.

Recommendations

The time has now clearly come for Iran to produce a more detailed Balance of Payments to cover the year 1327 (1948), as far as possible exactly on the lines given in the paper referred to. This is a task which is within the capacity of the Bank Melli Economic and Statistical Bureau and it is recommended that it should be proceeded with at once.

The following specific recommendations are also made in this connection:

1. It must be clearly understood by all Government Departments from which figures are required by the Bank Melli for this vital calculation that this matter is of the utmost importance to the country and to the control of the finances of the Seven Year Plan, and that no effort must be spared to produce immediately as accurate figures as possible. It is not a question here of the authority of one Government Department over another, but of the general needs of Iran; and it should be regarded as a patriotic duty by those who are requested by the Bank to produce figures to make every effort to provide these, even if this is not within the routine obligations of their work.

2. The Fund states that there will have to be considerable flexibility in employing the Manual for reporting purposes and that when grave difficulties impede the production of information in the form desired, this form need not be rigidly adhered to. Nevertheless, as they point out, the scheme fits logically together, and it is therefore preferable to try to follow it as closely as possible. It is recommended, therefore, that Iran should follow this scheme, which the series of meetings held has proved to be by no means so complex and difficult as it appeared at first sight; but that unnecessary work should not be wasted over those details which are found difficult. The paper referred to above should be used as a guide on when to follow the I.M.F. Manual meticulously and when to employ a more liberal interpretation.

3. It should be noted that the Fund invites consultation with reporting countries on difficulties and it is recommended that in such cases Iran should frankly state these to the Fund and ask their advice and assistance.

4. The Balance of Payments should be calculated on the Iranian year, until such time as the Customs Authorities carry out the recommendation made elsewhere in this report that their statistics be worked out on the "brick" system for both the Iranian and the Gregorian year. It will then probably be found possible to calculate on the Gregorian year, which will be of more value for international purposes for which the Balance of Payments is at least partly produced.

5. Attention is drawn particularly to the following points in the International Monetary Fund's Manual and in the paper presented to the Bank Melli thereon:

   a. Definition of "resident";

   b. Treatment of gold transactions;

   c. Uniform valuation of merchandise on which there are three important notes in the detailed paper;

   d. Discussion of the trade tables;

   e. Inclusion or otherwise of bunker fuel and ships' stores sold to foreign ships;

   f. Handling of motion-picture film rentals;

   g. Handling of internal freight and insurance charges;

   h. Handling of import and export duties;

   i. Detailed discussion of gold transactions;

j. The transportation discussion;

k. The insurance question;

l. The discussion of I.M.F.'s Table XI—long-term capital transactions;

m. The discussion of I.M.F.'s Table XII—short-term movements.

6. Owing to the great interest to the Plan Organization of this calculation, not merely in its final form but in the details of its construction, it is essential that at each stage in the calculation close liaison be exercised with the Central Statistical Bureau. Indeed, in the case of calculations after that for the year 1327 (which will presumably be largely completed before the Bureau is set up) much of the collection of figures from Government Departments outside the Bank Melli should be done through the agency of the Central Bureau, in accordance with the system outlined later in Exhibit P-12, whereby this Bureau is the "Exchange and Mart" for all statistical information required by one Government agency from another.

Budget

This work will involve no extra expenditure.

Currency

Present Situation

Records of the fiduciary issue of Iran are extremely important from the point of view of the Seven Year Plan's finance; and it is fortunate, therefore, that they are clearly shown by the Bank Melli in its fortnightly balance sheet. The figures are published in the monthly Bulletin in a form showing at each period the banknotes in the cash department and in circulation and the total, and the reserves against which the issue is made. The figures meet the normal criteria of good currency statistics; for example, their rise or fall can be readily seen, the issue against cover is clearly indicated, and so on.

Recommendations

It is only desired to make two minor specific recommendations on the figures as at present published:

1. It is probably not necessary in the monthly Bulletin of the Bank to show the fortnightly figures for banknotes issued over such a long period, and it is suggested that the list of figures given be shortened.

2. It might be of interest to show from time to time how much of the total banknotes issued is in different denominations, and to this might be attached for the sake of information a statement of the metallic currency in circulation if this can be readily derived. Consideration has recently been given by the Bank to the question of installing mechanized accounting in certain branches, which would include mechanization of the note cancellation records. It is possible, however, that this system will not be adopted. In this case it is desired to recommend that the Bank try out, for certain specimen batches of notes, the system of controlling note cancellation and its records by machine on the punched card machine pool of the Central Statistical Bureau. This can be done with considerable economy of effort and it is not necessary to waste an enormous number of punched cards on the process, for each card can readily be made to function five times.

Budget

There are no extra costs involved in these recommendations.

Exchange

Present Position

Exchange statistics are maintained by the Foreign Department of the Bank Melli, which receives fortnightly sheets showing the exchange transactions carried out, from each branch, and from the head office of the British Bank of Iran and the Middle East in respect to its activities in the whole country. Telegraphic daily statements are also received, from which a running record is compiled which is checked against the fortnightly statements. From these returns, totals are made for commercial and non-commercial exchange sales, these figures having been initiated in 1325 (1946). An analysis has been made of exchange credits opened for the principal types of goods both for commercial credits and, for 1327 (1948), for non-commercial credits. These are most valuable figures from the point of view of the Balance of Payments.

Figures of exchange rates showing the selling rates of the rial against various currencies are provided by the Exchange Department to the Economic and Statistical Bureau. As the official rates do not alter frequently, only changes are recorded. Free rates are entered in a register from daily reports of the Bazaar Branch. Gold and silver selling prices and London prices are also collected.

The official exchange rates are published in the Bank Melli Bulletin, and recently the rather pointless repetition of identical rates has been changed to the showing of annual and monthly averages while exchange certificate rates are now also shown.

Recommendations

1. The exchange certificate rates are extremely interesting and their publication should be continued.
2. In Iraq a system is now being adopted by the Exchange Control Commission whereby each individual transaction for which foreign exchange is granted is recorded on a punched card which shows a reference to the various forms concerned, the bank, currency, license number, country of origin and so on, and the quantity and value of goods being imported against the credit. From this it is anticipated that very valuable statistics will be derived. It is recommended that after the punched card machine pool is installed in the Central Statistical Bureau a representative of that Bureau and of the Bank Melli should consider whether a trial run of these statistics might not be made on the machines.

There are no other recommendations in this field.

Budget

Nil.

Banking

Present Situation

The principal banking statistics of the Government are, of course, those of the Bank Melli which in themselves are good. It is needless to enter here into a detailed description of the work of the Accounts Department of the Bank or of the fortnightly

Balance Sheet statement which is divided between Issue and Banking Departments. This fortnightly Balance Sheet statement is passed to the Statistical Department of the Bank who publish it in the monthly Bulletin.

Within the Statistical Bureau attached to the present Plan Organization a number of banking statistics have at various times been collected. These include the Balance Sheets not only of the Bank Melli but of the Imperial Bank, Mortgage Bank, Agricultural Bank, Sepah Bank and Insurance Company of Iran. Discount rates are received from the Bank Melli and a number of extracts have been made from the Balance Sheets for comparative purposes.

Recommendations

1. It does not fall within the scope of this report to discuss in any detail the banking activities and the records of the Bank Melli; nor indeed from the preliminary examination which was made does there seem to be much improvement which could profitably be recommended. It was, however, recommended in an interim report previously presented to the Iranian Government that the Bank Melli should ask specialists from mechanized accounting companies to examine their Savings Bank Accounts, which appear to be the most suitable for mechanization. These can be done either by punched card methods or by a less elaborate type of accounting machine. In the case of the former some other records of the Bank could probably be centralized thereon, for example, note cancellation (as mentioned above) or personnel records. It is understood that the representatives of various companies have in fact examined the Bank's records and made tenders and that possibly one system or the other will be adopted. This may well be considered not only as a probable advantage in itself but as a test of the value of mechanization in this field.
2. It is suggested that, in the published Balance Sheet, those items which have been converted to rials for Balance Sheet purpose only should be indicated separately from deposits actually made in rials.
3. In addition to the separate issue and Banking Department statements, the Balance Sheet might also contain a joint issue/ Banking Statement which would allow cancelling out of any duplicated item.
4. It is suggested that the Bank Melli might make a study of two phenomena which fall within its scope—(a) real estate transactions and (b) the reasons for the extremely high rate of interest on short-term loans.
5. The banking statistics held by the present Statistical Office of the Plan Organization should become the nucleus around which a complete record of banking statistics is built up in the proposed Central Statistical Bureau. From this, totals of bank deposits should be maintained for the country and figures should be obtained on the total movement or clearance of checks. Publication of these figures should be made both in the monthly Digest and the annual Abstract.

It is not necessary to make any further recommendations in this field.

Budget

Any costs in carrying out the recommendations made on the Bank Melli's work will, of course, be carried by the Bank; while the statistical work on banking in the Central Statistical Bureau will be part of its normal costs.

Revenue and Government Accounts

It might be argued that the Governmental accounts of a country, the records of its revenue and expenditure, of its taxation and treasury, are not strictly speaking statistical, being equivalent to the accounts department of a business and a matter for a taxation specialist or an accountant rather than a statistician. The organization of the Ministry of Finance, moreover, is so vast and complex that it would take more than the time available to examine its records and system in detail and to make valuable practical accounting recommendations. Nevertheless, the revenues and expenditures of the Government are in themselves essential figures for the Plan Organization, and taxation records can provide valuable data of a purely statistical nature which is essential for the study of the National Income, distribution and many other matters. Taxation, particularly direct taxation, is in any case not merely a method of collecting money for the Government's activities, but an economic weapon in the control of inflation; and for this reason alone as well as for the financing of the Plan, income tax records must be studied. In the three sub-sections below three facets of the work of the Ministry of Finance—direct taxation, indirect taxation and Governmental accounts—are briefly studied from a statistical angle and certain recommendations made; all the other activities of the Ministry of Finance must be considered to be included in the blanket recommendation contained in the third sub-section.

The principal Government revenues are derived from such indirect taxation as the custom duties, the slaughter and gasoline taxes, and excise duty; from direct income tax, inheritance and donation tax, and stamp duties; from Government royalties and dividends; and from the profits of the working of Ministries, monopolies and Government-owned companies and banks. It is understood that Government-owned companies pay income tax, which in a sense is a double accounting. No attempt is made in the present section to deal with the complicated accounts of the working of Ministry monopolies and Government companies, but in the production chapter certain recommendations have been made on the internal accounting of Government industry, which should result in clearer figures, not only from the production point of view but from the standpoint of Government revenue. Customs statistics have been dealt with in a special section, and the royalties from Government concessions are mentioned in the section on oil and minerals. It is therefore intended to discuss in the present section only:

a. Income and other direct taxation.

b. Indirect taxation.

c. The Government accounts system.

Income and Other Direct Taxation

Present Position

There are several direct taxes in Iran, of which the principal are income tax, inheritance tax, donation tax and stamp duties. Figures on all these are handled by the Department of Direct Taxation in the Ministry of Finance, which has a statistical section divided into two parts dealing respectively with Tehran and the shahristans. The ad-

ministration itself has an office in each shahristan. Income tax is applicable on the progressive system with a fixed minimum income and no allowances; inheritance tax is a form of death duty, and donation tax has the same intention as a death duty; the stamp duty collects fees by means of stamps fixed to waybills, checks, and so on, some of which are prepaid and others purchased.

Information is collected by the Statistical Section from the reports made by each shahristan monthly of the collection of each type of direct tax; from this a summary is prepared monthly and annually showing the amount collected from each tax. The figures for Tehran are more directly compiled.

Taxpayers are recorded in files, one file to each taxpayer, in which the annual declaration is placed. Assessments are made on this basis, but the majority of taxpayers raise objections, and these are sent to commissions who give a decision on the matter. When the tax has been collected a copy of the receipt is filed and the whole is registered in the Tax Roll book. Here the taxpayer is indicated by name and number, and all the steps in the process, such as assessed income, assessed tax, results of appeals and tax collected, are shown.

Graphs are maintained showing the number of tax files opened and the employees. A table is constructed showing the work of the income tax commission, and a recent special job done by the department has been to appraise the income tax of shop-keepers in Tehran. An interesting study was made by employees who actually surveyed shops street by street and produced lists giving the number for each type of occupation with a grading.

At the time when this section was visited a "personal tax book" had been devised but not applied, giving all tax records for the particular person over a period of years, with an assessment form which could be torn out, and even circular letters and notices perforated for extraction. It is not thought that this system has yet been applied.

Recommendations

1. The statistics on shop-keepers in Tehran should be provided through the Central Statistical Bureau to the Marketing Section of the Plan Organization. They are of the very greatest importance in assessing distribution.

2. The "personal tax book" or something like it should be adopted.

3. On the setting up of the Central Statistical Bureau, specialists therefrom should, with the co-operation of the Ministry of Finance, examine the tax records to ascertain whether these can be more conveniently handled and quickly analyzed on a punched card system. This will enable figures to be split by type of taxpayer. It is suggested that the Tax Roll book be the basic record from which cards are punched if the "personal tax book" is not taken into use, but that if the latter is adopted one page of it be a detachable dual-purpose punched card. These cards would be punched to show the following details which can all be included in a 65- or 80-column card, whichever is adopted by the Central Statistical Bureau—Year/shahristan/bakhsh (when relevant)/assessment number/source of income/type of taxpayer/gross income/assessed tax/tax after appeal/tax collected, probably divided according to grading.

4. Using this system the whole recording of income tax can be tightened up and check lists can be issued from the machine for the use of inspectors.

5. The collection of stamp duties should be studied.

Budget

Any costs of printing will fall against the ordinary revenues of the Ministry of Finance. Machine costs will be absorbed as part of the normal servicing function of the Central Statistical Bureau.

Indirect Taxation

Present Situation

Indirect taxation is of two types: namely (1) general indirect taxes, handled in the Department of Indirect Taxation, and (2) the cultivated land tax, handled in a special department, which is in effect a form of direct tax replacing income tax in the case of agriculturists.

1. The principal indirect taxes handled by the appropriate department (and hence excluding customs duties dealt with elsewhere) are the excise duties on alcoholic drinks, the tax on petrol sold in Iran, and the slaughtering tax. There are also various minor taxes. The alcohol tax is actually a composite tripartite tax consisting of excise, a municipal tax, and a "commercial profit". The theory of the last-named is interesting: the Government has by decree a monopoly of alcohol production, but in fact leases this out and collects 12½ per cent as its "profit". The alcohol tax is collected partly by sale of the paper strip which is placed over the top of the bottle, and partly, in the case of beer, at source on bulk production. Statistics on the yield of these taxes are collected first by the Excise Department and passed to the Department of Indirect Taxation. The main difficulties are perhaps:

   a. Lateness in the figures, and

   b. Some inaccuracy in the beer tax figures, which do not appear to take account of money refunded if the brew turns out badly.

   Gasoline and oil taxes are collected at source by the Anglo-Iranian Oil Company, and for these the statistics are certainly accurate. The taxes are allocated to the Government on sales in the country as a whole and to the municipalities on the varying sales in the different towns. The Department of Indirect Taxation acts as the municipalities' agent in collecting their share.

   The slaughter tax is collected at the slaughter houses, either directly by a Government official or by an agent.

   The Department of Indirect Taxation, like the Department of Direct Taxation, receives from each shahristan the monthly totals of each type of tax collected with a comparison for the same month in the previous year. The cash, of course, passes to the central Treasury and the accounts to the central Audit Department. From these statistics a sheet is produced, showing by areas the receipts for each type of tax with Tehran separately.

2. The cultivated land tax is based on an assessment made between 1304 and 1313 (1925 and 1934). Two registers are kept, one arranged by the names of the pieces of land, and one by owners who, of course, may own several pieces. There is a set of books for each shahristan. If the owner has land in several shahristans this is apparently ignored, and collection is made separately for each shahristan; the tax is a flat rate percentage based on the output of the land between 1304 and 1313. Since this output was quantitative and not based on value there is a rise and fall in the takings due to the rise and fall of prices. The tax does not appear to take into account changes in cultivation, and is not quite consistent in its application since for some products the official price is taken while for some the varying market price appears to play a part. Under this system it is not surprising that the whole collection is remarkably small. It can readily be seen that even if the output of the land has increased the only thing reflected in the collection is a rise in prices. It was stated that an attempt was made to include new land brought under cultivation by taking declarations from owners, the responsibility lying with provincial officials, and there is a system for assessment of the tax on State domains sold to the public. In general, although each shahristan sends a monthly return of its collection, it may be said that statistics are lacking.

Recommendations

1. The figures of indirect taxes seem a little confused on first examination, and they should be made the subject of close study by the commission recommended below under government accounts.

2. The statistics of the cultivated land tax are not in sufficient detail, and the basis of assessment is out-of-date and unsound. This tax too will require detailed study by the commission and it is not proposed to make a specific recommendation here.

Budget

If and when reorganization takes place the costs must fall against the revenues of the Ministry of Finance.

Government Accounts

Present Situation

The theory of the accounting system of the Government is that the accounts of all Ministries come to the Centralized Accounts Department for consolidation, are submitted to an Accounts Tribunal and utilized at the end of the year to carry out the process known as Liquidation of the Budget. There are auditors in the provinces and in each Ministry, who examine the documents of expenditure and revenue and send these at the end of the month to the centralized office. These documents cover both the head offices of the Ministries and the provincial offices. A sum is placed at the disposal of each responsible accountant in the provinces, and as it is spent the accounts passing through the auditor are the supporting documents for a further credit.

The monthly returns thus show with supporting documents all the figures of expenditure and receipts in any particular area or Ministry. The Centralized Accounts Department enters, in registers against each shahristan, the receipts itemized by type, for example, income tax, stamp duty, Government profits, and so on. Expenditure is

similarly entered according to budget divisions. It appears that the papers do not always pass quickly through the hands of the responsible accountants.

At the end of the year the Department compiles the complete accounts of the Government showing all the receipts and expenditures. They do not appear to make up monthly accounts for the country but only the annual figure for the liquidation of the budget. The Treasury, however, keeps a monthly figure of lump sums allocated and receipts, from which a monthly check could be obtained if required.

Various other departments, for example, Verification of Documents Department and Budget Department, are also concerned with Governmental accounts, the former being concerned with checking allocations made by the Treasury to the responsible accountants and the latter with the forward estimates of the budget. The keeping of accounts for various Government industries should be the duty of the Economic Trading Accounts Department, but this does not appear to produce very up-to-date figures.

Recommendations

In effect, though so many Departments are concerned, the actual accounting procedure of the Government is centralized in the one Centralized Accounts Department. This is not equipped with any machines of even the most elementary type, and has the laborious job of entering all the accounts in registers. It is recommended that when the punched card installation of the Central Statistical Bureau has been built up, a section of the figures should be tested on the machines to ascertain whether consolidation could not more simply be obtained by this means. It will certainly produce a more detailed analysis.

Budget

The cost of this may, for the time being, be considered to fall against the Central Statistical Bureau.

General Recommendation

It will be seen that few specific recommendations have been made on the direct and indirect taxes and the centralized accounting system of the Government discussed above. As stated in the opening paragraphs above, the Ministry of Finance is so large and complex an organization, and so much concerned with accounting rather than statistics, that it is thought that the present report is not the place for detailed recommendations. The improvement of the Ministry's accounting records—which appear to vary in quality from very good to somewhat confused—may involve reorganization of an extensive nature and also questions which are beyond the scope of the present report. The experience of those utilizing the Ministry's figures, for example, the Bank Melli in constructing its Balance of Payments or in assessing the possibilities of calculating National Income, seems to show that, whatever the accuracy or completeness of the figures, they are not very readily available. It must be remembered that every Ministry and every Government official is the "servant" of the country and that there must be free play and interchange of figures from one Ministry to another when required for mutual administrative efficiency. It is partly to act as a distribution center in such a free play of figures that the Central Statistical Bureau is recommended.

It is considered, therefore, that both with a view to serving the general needs of the Government and to handling the burden of increased revenues and expenditures thrown upon it by the Seven Year Plan, the Ministry of Finance should establish a commission to examine all its statistical and accounting systems (with the exception of those within Government factories and of the Customs which have been specifically dealt with in preceding sections of this report) and to make recommendations for improvement. This commission should be under the chairmanship of an Under Secretary of the Ministry and should include two senior officials from the Ministry, one from the Central Statistical Bureau and one from the Bank Melli. These officials will be too senior to spend the months of work which will probably be necessary in the detailed examination of the extensive records of the Ministry. They should be aided by a working party under their control which should consist of two Ministry of Finance officials, of which one should be from the Taxation and another from an Accounts Department, two Bank Melli qualified accountants, and one member of the Central Statistical Bureau staff. This working party will particularly consider (a) the effectiveness of the present system; (b) the system in the provinces; (c) the possibility of introducing either simple or punched card accounting machines or the use of the Central Statistical Bureau machine pool for some of the work. The detailed reports of the working party and their suggested systems will then be considered, re-drafted and approved by the commission, which in turn will report to the Minister of Finance for his approval of the introduction of any new system. Throughout, the commission and its working party will be under the control of the Minister of Finance and responsible to him so that the integrity and powers of the Ministry will be preserved.

Wholesale Prices and Index

The wholesale prices of a country, particularly when expressed as an index to show their general trend, form one of the best indicators of the inflation danger. Their production is a regular feature in most countries with an advanced financial system, and some of the better known indices, for example, the Bureau of Labor Statistics indices in the U. S. and those of the Economist, Statist, and of the Board of Trade in the United Kingdom, have almost achieved historical importance. It is vitally important for the Seven Year Plan that the Wholesale Price Index of Iran, which already exists, should be made both complete and sensitive, for the effect of any rise in wholesale prices might be a very dangerous one, both having regard to the internal financing of the Plan and Iran's international economy, if it were not watched with care and the necessary checks applied. In the Bulletin of the Bank Melli in which the first test of this index was described (No. 8 of August 1936), it was said that "l'observation du mouvement des prix est un nécessité impérieuse". This is still true. Fortunately a calculation and price collection system already exist and hence, as in Customs statistics or the Cost of Living Index, it is possible to make more refined recommendations on a firm existing system.

Present System

The first test of the Wholesale Price Index in Iran was made on the basis of a study of prices for Farvardin 1314 (1935), and is described in the Bank Melli Bulletin referred to above. The present index rests on a 1315 (1936) base and the selection of items contained therein is still largely that of the original study. The main criteria in making the choice were: necessities included in the Cost of Living Index; raw materials required for construction; main imported and exported articles. In other words, the raw materials

chosen have been those affecting the finances of the country internally and externally most markedly. Against this base are set present prices reported by the Bazaar Branch of the Bank in Tehran by a member of the staff specially trained for the purpose. The same specific grades and qualities of articles, 455 in total, are taken each month and the prices are recorded in special books. Not all of those, of course, are chosen for the compilation of the Index, though the great majority are published in the Bank Melli Bulletin. An attempt is made to choose a representative price. Out of the 455 articles, the present list chosen for the Index contains 61. The calculations are simple, direct and well-organized, clear special sheets having been printed for the purpose. These sheets show average price of the chosen articles in 1315 (1936), the present price, the price relative and the logarithm of the price relative. These logarithms are then added and divided by the number of the articles in that section of the Index, thus producing the logarithm of the Index from which the Index Number can be obtained. In other words,

$$\log I = \frac{\log \frac{P_{p1}}{P_{b1}} + \log \frac{P_{p2}}{P_{b2}} + \ldots\ldots\ldots\ldots + \log \frac{P_{pn}}{P_{bn}}}{N}$$

where P_{p1} is the price of an article at present, P_{b1} is the price of the same quantity in the base-year calculation, P_{p2} and P_{b2} are prices for a second article, and so on, and N the total number of articles in the Index. The calculation is, therefore, by the geometric mean. There are four component sub-indices on foodstuffs and a total foodstuffs index, two on raw materials with a total, and four other sub-indices covering fuel, metals, textiles and construction materials. The indices are then combined to form a general index and in addition three special indices are made showing export goods, import goods, and goods produced and consumed internally. This is done by choosing items from the list and re-combining them in the same way as the main Index. The indices are published in the Bank Melli Bulletin.

Recommendations

These indices are well organized and go a long way, but not far enough; and even as calculated now they are open to several criticisms, of which the major are:

1. The choice of raw materials is somewhat arbitrary.
2. The prices are entirely for Tehran, except for jute which is on market prices at Resht, and dates which are on prices in Shiraz. It is very doubtful whether the Tehran price, for example, really represents the price of the bulk of rice production in the country.
3. There is no weighting, which is easily the most serious criticism which can be made against the whole index system. No index is in fact unweighted; if we do not apply weights, we are only in effect giving equal weights, which may be a very arbitrary thing to do.

It is therefore recommended that the Bank Melli Statistical and Economic Section make studies in preparation for the compilation of the two new wholesale price indices as follows:

1. A small weekly index of 12 to 15 articles should be compiled, for which a proper weighting system can be obtained almost immediately. These weights should be taken not on Bazaar transactions in Tehran but on estimated consumption for the whole country, taking into account exports

and imports. This may be done by estimating the country's production of each of the dozen articles chosen, subtracting exports and adding imports. Since these figures are only obtainable on the basis of the whole country, the index must cover the same area and therefore prices must be constructed from the arithmetic mean of prices in several typical places. As this is not intended as a highly scientific elaborate index but merely as a quick indicator, it will be sufficient to take the prices at those places where the particular commodity is in good supply; for example, prices in Resht and Babul will be included among the rice prices. In addition to this weekly index there should be a monthly index based on it. The prices should be sent in weekly from the Bank branches in the appropriate towns and from the Bazaar branch in Tehran, and be combined here.

2. The second index should be the true Wholesale Price Index and should cover up to 200 items. It will be commenced only after a full study has been made of the weighting and may possibly have to await the Census of Production and the creation of the proposed Estimation Service of the Ministry of Agriculture. This index will be on a regional basis, with regional lists of prices submitted by the banks in the towns of the appropriate regions and with regional weighting. The national index may be constructed either by mathematical combination of the regional indices or by taking national weights from the same study that produced the regional weights and calculating them afresh. The latter alternative though more complicated is recommended.

Three further specific recommendations are made:

1. The index should be genuinely a wholesale price index in that it should cover consumer goods in their wholesale form and not be confined to producer goods (in fact, it has not been in the past.)

2. The index should be calculated on the weighted geometric average system.

3. The assistance of the Central Statistical Bureau should be enlisted in the later stages of designing the larger index, and the index figures and prices must be provided regularly to the Bureau in advance of their publication, as they will be an essential part of its records.

No. 2 above is not an easy question to resolve. A number of writers on statistics endorse the weighted arithmetic mean as well as the geometric mean; but on the whole the consensus of opinion inclines to the latter. After careful consideration it is recommended that the geometric mean of weighted price relatives be employed on the grounds given by the British Board of Trade for adopting this system in the Board of Trade Journal of January 24, 1935, which are as follows:

> "This method of construction is particularly advantageous in the compilation of index numbers of wholesale prices for a number of reasons. As compared with the use of arithmetic averages it has the effect of reducing the influence of upward movements in prices and increasing that of downward movements, modifications that correspond to the decreased or increased consumption that is liable to accompany such price movements. This feature has particular importance in cases of abnormal variations in price of individual articles. The principal advantage of the geometric method of averaging is, however, that it enables a change of base year to be made without affecting the proportionate change in the general index or in any group index. If the arithmetic average is used, the apparent change in prices between two years would ordinarily be different according as the calculations were made with the earlier or the

later year as base year. The geometric method of averaging secures that an index is reversible, so that the relative price change between 1920 and 1930, for example, is the same irrespective of whether 1920 or 1930 is used as the base year. The method has the further advantage that it enables quotations which have ceased to be representative of the course of market prices to be replaced by more representative quotations without affecting the balance of the index. Between the construction of the index in 1920 and the end of 1934 no fewer than 35 such changes had been made."

The question as to whether the index should be changed to a particular year or linked (as on the whole seems preferable) to each preceding month should be made a matter for consideration and discussion; indeed, the above recommendations, like many which are made in this section of the report, are all subject to reasonable and informed consideration.

Budget

The cost of studying and preparing this new index must inevitably be borne out of the Bank Melli's own funds.

Retail Prices and Cost-of-Living Index

The cost of living in Iran is high and has risen markedly since the present Cost-of-Living Index was first constructed. The rise received a great impetus from the war, partly owing to the decrease in imports, partly owing to the presence of foreign troops, and partly owing to the general economic upset attendant upon the war's impact upon the country. Since the end of hostilities the cost of living has fluctuated considerably. It is very necessary that a sensitive indicator should exist of the effect of economic movements on the man in the street, and particularly of the economic effect of the Seven Year Plan. On such an indicator, that is, a well-calculated cost-of-living index, depend many things such as the control of labor, wage rates, the application of Government controls, allowances to Government servants, subsidies, the control of import duties, and the choice of the fields in which increased production is most necessary. A good index already exists, calculated by the Bank Melli; but this was started several years ago and it would now seem desirable to revise the original study on which it was based and, if possible, to calculate indices for various groups of items and various areas. These indices should be constantly in front of the head of the Plan Organization as a guide to when and how expenditure can be filtered in and how it must be controlled.

Present Position

The Cost-of-Living Index calculated by the Bank Melli was first envisaged in the Bank Melli Bulletin No. 6 for October, 1935, where the original family budget study is described. In the long article on the subject it is pointed out that this was the first family budget study made in Iran, and that when the method and results of the original research are considered this fact should be borne in mind. It was impossible to distribute budget books to families and the completion of the family budget schedules was controlled by the Bank. The study covered Tehran, six large cities and 21 smaller towns, and 617 households were included altogether in the proportions 118: 182: 317. It will be noted from these figures that there could not have been many families studied in each of the towns, and that there was, therefore, some danger of the choice being unrepresentative. The

selection was limited to persons of the lower middle and artisan class, but the incomes on the whole seem to be those of the working class. The average income, for example, in the big towns was only Rls. 217 per month, which was extremely small if the then rate of exchange of Rls. 80 to £1 be taken. In fact, however, the purchasing power of the rial at that time was considerably more than 1/80th of £1, and the choice was probably therefore just above working class. Even if we accept the statement that the study covered lower middle class as well as upper working class, there is undoubtedly some bias in the choice of family; for example, in the six large towns, out of 182 families 105 had less income than Rls. 200 per month. Yet in Tehran 66 out of 118 had an income of from Rls. 300 to Rls. 400 per month, and in the small towns, out of 317 families 137 had incomes of Rls. 300 to Rls. 400 per month. Clearly this bias is not wholly explained by the higher level of incomes which existed in Tehran. There may, of course, have been difficulty in finding an adequate sample, but these figures do seem to indicate that some degree of bias entered from the outset.

Tables were then constructed showing for each of the income groups the amount spent per month under the five heads of food, rent, heating and lighting, clothing and general. It may be the choice of family groups which produced the somewhat curious result of an apparently greater expenditure per family (particularly on rent) in the small towns than in the large ones (with, of course, the exception of Tehran).

From these tabulations calculations were made for each of the groups of towns and for the whole country, showing the percentage of the total income spent, not only on each of the five groups of expenditure items, but on all their main component items.

The actual first calculation of the Cost-of-Living Index is described in the Bank Melli Bulletin No. 11 of May 1937. In this article the figures of the original family budget study are taken and slightly revised to give the proportions into which the expenditure of an ordinary lower middle class family is divided. These are the weights which are given to each group and each article in the Index, and are designed to cover the whole country; that is, they are composite figures based on the family budget studies in all the various places with certain adjustments. These weights multiplied by the monthly expenditure of the average family and divided by 100 (since the weights were expressed as percentages) gave the monthly expenditure on each article taking into account the revised weights; and these expenditures, divided in turn by the price of each article in Farvardin 1315 (1936), gave the monthly consumption at that period. These figures are not used in the present Index and were produced mainly for comparative purposes.

Prices were then obtained for the whole of 1315 and the first indices were calculated on the weighted arithemetic mean of price ratios formula. These 1315 prices are still used as the base price and the original weights are still taken. It was not found possible to weight prices by the importance of different localities, and the base for the rent calculation is somewhat doubtful. Apparently vegetables were generally omitted owing to the difficulty of obtaining a base year price for these seasonable commodities.

The Index is still calculated on very much the same system. The Bank Melli Statistical and Economic Department receives weekly, from banks in Tehran and the six larger towns, returns covering the items chosen in the original study for the Cost-of-Living Index. These prices are entered in a register (possibly an unnecessary step) and the average for the four or five week period is made and transferred to a summary sheet for all seven places. The weekly averages are, correctly enough, unweighted. The figures on

the sheet are then totalled and averaged for the whole country. This averaging again is unweighted, and so the price of a commodity in the area in which it is scarce is of just as much importance as in the area in which it is plentiful. The rent is taken on five houses chosen in the same quarter for each period. For each group of commodities the figures are transferred to yet another sheet, and each of the sub-indices is calculated by the weighted arithmetic mean. The price ratio system is adopted; that is, the average price of a particular commodity at present is ratioed against the 1315 price and this ratio is multiplied by the weight, the resulting figures being summed and divided by the sum of the weights. The effect of this is exactly the same (weighting being in fact by value, that is, price multiplied by quantity in the base year) as if we had taken the ordinary arithmetic mean weighted index formula of

$$I = \frac{P_{p1}\ Q_{p1} + P_{p2}\ Q_{p2} + \ldots\ldots\ldots + P_{pn}\ Q_{pn}}{P_{b1}\ Q_{b1} + P_{b2}\ Q_{b2} + \ldots\ldots\ldots + P_{bn}\ Q_{bn}}$$

where P_{p1} is the present price of the first item, Q_{p1} is the present quantity of the first item, P_{b1} is the price of the same item in the base year and so on. By this means the component sub-indices are compiled, and these are combined by adding the sum of the weight ratios and dividing by 100. This is, of course, perfectly correct. It was stated that a separate index is calculated for Tehran but not published, using the same weighting as for the whole country. The staff of the Section was inclined to take the view that these coefficients were sufficiently near for Tehran, since Tehran weighted the original calculation so heavily.

Recommendations

The Cost-of-Living Index of the Bank Melli is one of the best statistical productions in Iran and this fact must be remembered when the criticisms below are read. It is calculated on the correct mathematical lines and was constructed on the base of an original study which seems to have been made with a good deal of care. In the original study, for example, as is remarked in the Bank Melli Bulletin No. 77 of August/September 1945, "A great deal of time and patience was required for adjusting the local weight units of the townships and villages to the gramme units recently introduced in Iran."

There are, however, some valid criticisms which can be made of the existing Index of which the principal are:

1. The distribution of families in the original budget study may, as stated above, have been slightly biased, and in any case the number of families does not seem to have been quite sufficient to give a representative sample in all the places chosen.

2. The base prices were not weighted between towns, nor are the present prices.

3. The base of the rent calculation is somewhat doubtful. In examining the sheets of the present calculation it was seen that there is in Tehran a tendency to take the rent of a room, but in provincial towns the rent of a house; hence one or two provincial rent figures are actually higher than those for Tehran, which is almost certainly wrong. It was argued, when this matter was discussed, that the worker in Tehran lives in a room but the worker in, say, Isfahan can afford a house. This, however, is begging the question and does not give a uniform housing standard; the object of a Cost-of-Living Index is to see how much is the cost of living on the

the same standard at different dates in different places. It is also difficult to see on what basis the choice of five different houses in the same quarter is made.

4. While the original family budget study (though not the original Index calculation) covered Tehran, the six large towns and 21 smaller towns, the present prices are taken for Tehran and the six large towns only.

5. It is not absolutely certain whether the banks in the provincial towns are now reporting prices with the same care as at the outset.

There is, however, another and more serious fault in the Index, which is not due either to the original method of calculation or to those handling it, but merely to the passage of time, and which is inherent in all indices of this nature which have proceeded far from their base year. The Index of the Cost-of-Living shows changes in cost, provided the family living standard remains constant. The Index does not measure the effect of high prices in debasing a living standard, though we can evaluate this if we combine it with a wage index to give an index of real wages. In the Cost-of-Living Index itself we are assuming that the living standard remains unchanged; but in actual fact the budget composition for a typical family will have changed as real wages rise or fall, that is, as the ratio of present wages to base year wages divided by the Cost-of-Living Index varies. Hence we have the inevitable tendency described very clearly by M. Alfred Sauvy in the Review of the International Statistical Institute, Volume 16, No. ¼, when he says: "D'une façon générale, la méthode classique conduit, à la longue, à des indices trop élevés. Les marchandises qui deviennent plus abondantes et dont le prix baisse, de ce fait, ne sont, en effet, pas suffisamment réprésentées. À l'opposé, une marchandise qui devient extrêmement rare et chère conserve sa pondération et pèse trop dans le budget." This is a natural tendency, and for this reason the re-basing of a Cost-of-Living Index must not be done at too long intervals.

It is recommended, therefore, that the Bank Melli organize as soon as possible a family budget study in order to provide the base for a new Cost-of-Living Index.

1. This study should cover not one month but a whole year and the results be averaged to give a typical month.

2. The study should cover, not only Tehran and the six towns previously chosen, but also Shiraz, which is somewhat inexplicably omitted, and a number of small towns.

3. If possible there should be a double study, one for the laboring class and lower working class, the other for the higher artisan and lower clerical class. It may be asking too much to suggest that there should be a middle class study.

4. The treatment of fruit and vegetables in this study and in the subsequent Index number calculation will have to be considered with care. The British Ministry of Labour, which calculates a Cost-of-Living Index number, omits all fruits and vegetables except potatoes, "owing to the wide variations in quality, the seasonal variations in supplies, and the consequent impossibility of obtaining continuous and comparable records of prices." An ingenious method of overcoming this difficulty is given in the Government of Palestine General Monthly Bulletin of Current Statistics, June 1943.

5. Direct taxation should be always omitted from a Cost-of-Living Index.
6. The study should cover many more families than the original one, so that there is a substantial and representative selection from each town.

On the basis of this budget a new set of Cost-of-Living Indices should be commenced. One employee in the Bank branch in each of the towns chosen should be instructed how to calculate the weighted arithmetic mean type of Cost-of-Living Index. The weights for that particular town will be set following the family budget study, after conference with a representative of the Economic and Statistical Section of the Bank, who will visit each of the towns in turn to check the results of the family budget study, instruct the employee in method, and devise the weights. The work will be done on standardized forms. (It should be needless to add that representatives of the Economic and Statistical Section will have made a prior visit to the towns to organize the family budget study). As a result of this calculation a simple Index will exist of the cost of living in each of the towns chosen.

The prices (taken weekly and averaged as at present) will be sent up monthly from each town, together with the calculated Index; and in Tehran the calculation will be made of—

1. certain regional indices, and
2. a major Tehran Index and a major Index for the whole country.

These indices may be compiled either by producing averages of the prices weighted according to the importance of the towns and then making the calculation, or by combining the town indices mathematically, weighting them by the relative importance. This latter would seem the more satisfactory method if properly handled mathematically, since it can be made to allow for the fact that different articles are of different importance in different places, this factor having been taken into account by the application of different article-weights in the towns. If the first method were used we should, in producing the average prices, weight not only by the relative importance of the towns, but also by the relative importance of that particular article.

All the above indices should be two-fold, that is, for the laboring class and for the lower middle class, as suggested above. It may be thought that the net result will be to produce a considerable complication of indices and a good deal of work; but this will be amply justified by results for, as explained in the opening paragraphs of this section, a system of sensitive cost-of-living indices is absolutely essential for gauging the effect of the Plan's expenditure on the consumer.

At a later stage consideration can be given to utilizing the prices for the calculation of retail price indices.

It is recommended that the work of compiling these indices be done as far as possible in conjunction with the Central Statistical Bureau, and that the following publications be carefully studied:

Supplement to the United Kingdom Monthly Digest of Statistics, revision of March 1949, pages 44 and 45 (dealing with Interim Index of Retail Prices).

Any publications made by the Statistical Commission of the United Nations as a result of the decision that they should study Index Numbers.

Statistical Memorandum on Prices and Price Indices, published by the Dominion Bureau of Statistics, Ottawa, Canada, 1948.

Weekly Expenditure of Working Class Households in the United Kingdom, 1937-1938, published by the Ministry of Labour 1940-1941, in three parts; and reprinted by H. M. Stationery Office.

The "Z" forms used by the British Ministry of Labour for their Index.

The Ministry of Labour (Great Britain) pamphlet on The Method of Compilation of the Cost-of-Living Index.

The following publications of the International Labor Office:

Methods of Conducting Family Budget Enquiries, 1926.

A Contribution to the Study of International Comparisons of Costs of Living, 1932.

International Comparisons of Cost of Living, 1934.

The Worker's Standard of Living, 1938.

Methods of Family Living Studies, 1940, by Robert Morse Woodbury.

International Comparisons of Food Costs, 1941, by Robert Morse Woodbury.

Cost-of-Living Statistics, 1948.

Budget

The costs of making this study must be met by the Bank Melli.

Registration of Companies

Statistics on this subject are not strictly of financial interest only, but might well have been included in the earlier section on Commerce and Distribution. However, since they are normally published in the Bank Melli Bulletin it is thought to be fitting to include them in the present chapter.

Present Situation

The official registration of companies in Iran takes place in an office in the Ministry of Justice which annually sends to the Bank Melli a complete list of all companies registered during the year, showing their name, nature of business, type of company, address, date of registration, and so on. From this are made up full but straightforward statistics, of which a good specimen is the series given in Bulletin No. 81 of May 1946. This not only gives a detailed list of the companies registered during 1323 (1944), with their initial capital and percentage of paid-up capital where known, but analyzes these statistics in an article of considerable interest.

Recommendations

There are few recommendations which can be made in this comparatively simple field, but the following suggestions are made for any future publication of the Bank of similar statistics:

1. Nearly all the tables are cumulative, but this is not indicated and should be.

2. The graph given showing the number of registered companies and capital invested is an ingenious use of a combined scale which will only be satisfactory so long as numbers and capital preserve the fairly constant ratio of 1:1,000,000. It might be more satisfactory to use a logarithmic scale for such a chart.

3. The tables given on pages 566-567 of the Bulletin referred to should also show net increase in number of companies and net increase in capital. This might perhaps also be done on the tables following.

4. If possible foreign companies should show the capital appertaining to their operations in Iran, and not the total capital which may give a misleading impression of their Iranian operations.

Budget

Nil.

Civil Service Personnel and Pensions

The process of reallocating Government employees to new and more productive departments or enterprises will be a natural consequence of the Seven Year Plan; and the records of these, though not in essence statistical, have therefore been briefly examined here. Each Ministry in the Government of Iran has its own Personnel Department, in which are normally maintained service records for every employee in either registers or individual files. There is, however, a Pensions Department in the Ministry of Finance, which exercises some centralized personnel functions in the process of maintaining pension records. The statistics of this department are those which are discussed below.

Present Situation

This department endeavors to maintain a complete record of every Government employee in every Ministry, and requests Ministries to furnish particulars on the name, identity card number, date of employment, official grade, salary, allowances, marital status, children, place of birth, education and leave entitlement of their employees. The intention is eventually to enter these details in registers with one page for each employee and one book for each Ministry. Personal files are, it was understood, already maintained for each employee; and when the Department was visited a card index in duplicate was being produced to cover the Ministry of Finance's own employees. It was apparently intended that this system should eventually apply to all Ministries.

Pensions are allocated from the personal files of the employees; but these are not arranged in such a way that the department can know in advance what is the pension liability, nor is there any attempt to calculate the mathematical reserves which must be held against this liability. The system appears to be comparatively simple in that the employee's monthly superannuation is placed to his credit individually.

Recommendations

The personnel records were, when this department was visited, not yet complete with the exception of the employees' personal files; there was, however, the expressed intention of producing card indices and obtaining therefrom statistics. It would seem that

here is an excellent opportunity for using modern office technique and that the department should be examined at an early stage in the Plan (for the disposal of employees will be very important) in order to devise a good system of records. Elementary and somewhat confused though the system is, it is already liable to involve duplication.

The following recommendations are therefore made:

1. Only two main records are in fact required;
   a. a personal file for each employee should remain in the Personnel Department of the appropriate Ministry, and be transferred to the new Ministry on transfer of the employee or to the central Personnel Department in the event of his retirement or death;
   b. a card index record should be maintained in the centralized Personnel Department, probably on a visual index system. This card index should show on the front the employee's personal particulars, which will, of course, agree with his personal file, and on the reverse his pension contributions as received.
2. From the card index a punched card index should be constructed by the machine pool of the Central Statistical Bureau for statistical purposes and for the calculation of pension liabilities and the like.
3. The system will, of course, have to be worked out much more elaborately than this in that an exact control must link the records in the Ministries and the index in the centralized Personnel Department.
4. It will be necessary to initiate the whole system by a complete check of the personnel records of the Ministries with those of the Department, and of both by a census of Government employees taken on the first pay day of 1329 (1950). A simple method of comparing the records will then be to place on punched cards;
   a. the records of the Ministries;
   b. the records of the Department and
   c. the results of the census, and to match these up using the employee's identity card number as the link. Thereafter the three sets will be reduced to one, and the main card index be produced from them and from the files.
5. Persons on the disponibilité list must be included in the census, which will be applied to them by the Ministry to which they are nominally attached. Therefore, it is suggested, they should be removed from the strength of Ministries and put into one pool, statistically controlled by the central Personnel Department.
6. The advice of a specialist from the Central Statistical Bureau should be asked in working out the details of this reorganization of records and in drafting a census form, preferably self-coding, suitable for transference to punched cards.

Budget

The costs of this operation must be borne from the revenues of the Ministry of Finance, but arrangements might be made for assisting them from the funds of the Seven Year Plan and in particular from the funds of the Central Statistical Bureau.

CENTRAL STATISTICAL BUREAU AND METHODS OF IMPLEMENTING THE REPORT

CENTRAL STATISTICAL BUREAU

It will be remembered that it was stated earlier that the core of the whole statistical organization is the proposed Central Statistical Bureau, and that this would be at once a collection and publication center for all Government statistics, a servicing agency for Ministries in regard to highly technical work, the statistical office serving the Plan Organization, and above all the agency through which all the detailed recommendations can be co-ordinated and their application insured. Constant reference has been made thereafter, either to the provision of completed statistics to the Central Statistical Bureau or to its handling specially technical work on behalf of the Ministry. It has also frequently been recommended that the Bureau insure that certain recommendations be carried out or that its representatives sit on reorganization committees.

The Need for a Central Statistical Bureau

It should hardly be necessary, in view of the concept of a Central Statistical Bureau expressed above and the obvious part which the rest of the report shows it plays, to give any reasons for its establishment or to re-emphasize here the need. It is not too much to say that all the work of examining Iranian statistics embodied in this report and the bulk of the statistical plans made therein or envisaged in the Seven Year Plan will fall to the ground without the establishment of such a Bureau. Some particular reasons may, however, be adduced.

1. The supply of highly-qualified and trained staff in the country is by no means unlimited and in such a situation it is desirable to concentrate one's energies.
2. While certain advanced machine methods will be required, installations of punched-card machines are too expensive to allow of their being dotted about among all the Ministries of the Government. Hence, it is desirable that there should be some situation in which one centralized pool of machines can operate.
3. There is no central publishing agency in the Government and the nearest approach to a digest of statistics is the Bank Melli Bulletin. There should be some central agency through which the Government can publish figures on many subjects.
4. There should also be some central agency in the Government to which all persons seeking statistics on any subject can turn with the sure knowledge that they will either find the figures there or that the figures will be immediately found for them. This is a particularly important reason for the establishment of a central bureau, for only in such an agency of trained men can the necessary skill and inquiring spirit be found to insure that, when a request for figures is received, it is not misinterpreted and that the answer really meets the user's needs and is not merely a selection of the figures which came handiest.
5. Certain types of statistical work require the combination of figures from two or more departments. Only in a central statistical bureau does an agency exist which can do this.
6. It is absolutely essential that the Plan Organization should have a bureau of statistics giving information on all the subjects within the purview of the Plan. This alone makes a central statistical bureau attached to the Plan Organization inevitable.

7. Unless there is a central bureau, duplication of figures can never be eliminated in the Government since there will be no person or authority in a position to take a broad view of all the departmental work with the power to take action.

8. It is only in some one central situation that definitions can be arrived at and methods arranged so as to produce comparability and accuracy in the figures of the various departments.

9. There is no central agency in the Government for the production of statistics for international agencies, liaison with which is very important to Iran during this period of development.

10. During the building period of the statistical organization some experts will be required from abroad. These are an expensive element and Iran cannot afford many, nor is it desirable that there should be a vast influx. Consequently, there must be some central point at which these experts can be concentrated and from which they should operate.

Existing Centralized Statistical Agencies

At the present moment three agencies exist in Iran which have some of the functions of a central statistical bureau.

1. The first of these, and that which at the present moment most nearly resembles a centralized bureau is the former Bureau of Research and Statistics of the Ministry of Finance, now a statistical office attached to the Plan Organization. This office, which has been responsible for the most of the collection of statistics for the use of the Provisional Planning Authority, had at one time six technical sections concerned respectively with:

   Banking and Commerce

   Mines and Industries

   Finance

   Social Affairs

   Agriculture

   Publications

   Some of these have now been combined. Their work may be very briefly examined to indicate how far a sub-structure exists on which a bureau may be built.

   a. The Banking and Commerce Section is concerned with the collection of balance sheets, discount rates, bank regulations and foreign exchange statistics. These are derived, of course, from the various banks. It also analyzes the Customs figures and produces index numbers on a 1315 (1936) base which are concerned, however, with value only and are really straight percentages. Transport figures are also collected by this Section.

   b. The Mines and Industries Section at one time collected a considerable amount of information including figures on production from the Industrial Bank and from as many Government factories under the Ministry of Finance as possible, annual reports (miscalled "Balance Sheets") and some information on capital equipment extracted from the Bank files. Information on private factories seems to have been collected rather at random, partly from the Ministry of National Economy and

Ministry of Labor and partly by referring directly to factories. In obtaining these statistics the Section found a serious lack of co-ordination among Government Departments concerned with production, which has been referred to above in the appropriate chapter. The Section also does a certain amount of analysis of these statistics.

c. Finance statistics appear to be as complete as possible considering the existing situation in regard to Government financial statistics. Figures are held on income tax and on various direct and indirect taxes discussed under the head Financial above. There are also figures on the working and profits of Government monopolies and on Government-owned companies and banks.

d. The Section on Social Affairs collected statistics on population, utilizing the figures of the Civil Registration Department, and as many figures on education as the Ministry concerned could produce. From this a number of very interesting graphs were produced and statistics were also collected on justice and crime and on public health. Various ratios have been calculated. The list of statistics gathered by this Section is a fairly considerable one and the comments made by the head of the Section on the validity of some of the statistics are most interesting. Thus, it was found necessary to obtain figures on the University direct instead of through the Ministry of Education, while the statistics on the licensing of places of public entertainment "lost face" after the discovery that the police credited the city of Isfahan with only one picture house. Many of the comparisons made, for example, population against motor vehicles, number of doctors in contrast to number of Government employees set against population, are extremely interesting and illuminating.

e. Information of many kinds is collected by the Agricultural Section which has also compiled various lists of the desirable statistics on this subject. The studies made of agriculture in the country, particularly the two papers on the relationships between land ownership and agricultural production and the Veramin pilot sampling survey respectively, have been discussed in more detail in the agricultural section of this report.

f. The Publication Section which at one time existed was intended to be a publication center and collected both the Iranian and foreign governmental publications with this end in view. It was also concerned with compiling statistics for UNO.

2. It is unnecessary to refer here more than briefly to the work of the Statistical and Economic Department of the Bank Melli. This is a well-organized and competent department which is concerned with the production of a large part of the statistics referred to in the financial section of this report. It is not its aim to function as a central statistical bureau but to apply its technical ability and power of obtaining financial statistics from the branch banks to the production of certain derived or calculated secondary statistics for which at the moment no other location exists, for example, cost-of-living index. For a brief period, about ten years ago, however, the Department (perhaps stimulated by the total lack of a central statistical organization at that time) made an effort to collect economic statistics of many types for the whole country. It is probable that this was the first attempt of such a nature and indeed it was also the last of an equal scope. Iran was divided into areas equivalent to the branch banks. A 40-page questionnaire was then sent to these banks asking questions on almost every conceivable subject, for example, administrative lay-out, population, occupations, merchants, streets, cli-

mate, rivers, public utilities, building, principal institutions, health, education, communications, a wide range of agricultural information and industries. These figures were tabulated on a very large scale and, while they are now out-of-date and were never claimed to be completely accurate, they provide an interesting historical basis for comparison.

3. The Supreme Council of Statistics was originally created in 1313 (1934), not as an office for the collection of statistics but as a place where the organization and co-ordination of statistics could be considered by something rather equivalent to a parliament of the heads of statistical sections. Its budget is carried by the Department of Census and Civil Registration (which, for this reason, is sometimes called the General Administration of Statistics and Census) and in the original Decree the functions were said to include determination of the manner of collecting of statistics, insuring comparability, verification of figures and collecting data in order to summarize and publish these through the Census Administration. It is presumably on this last authority that the effort to centralize statistical publication in this Department has been based, but so far as is known publication has not taken place. Further functions were to assist in arranging censuses and to help in statistical training. This Council still meets regularly and has been responsible for the preparation of a number of forms and for some co-ordination of statistical work.

Recommendations

Establishment and Location of Bureau

It is very strongly recommended that a Central Statistical Bureau be set up at the earliest moment, forming part of any economic statistical department within the Plan Organization. This Bureau will not only have the same authority as any other part of the Plan Organization, but will be given permanency, status and powers within the governmental organization by the passing of a Law of Statistics, which is referred to in more detail under the final text head of this section of the report. The Bureau will be divided into sections which are set out, together with the suggested staff, in Exhibit P-10. The office will include a pool of punched card machines. There will also be attached to the Bureau a small section consisting of a foreign adviser and certain staff, the object of which will be to advise on the reorganization of statistical work throughout the Government, in accordance with the scheme set out in the present report. The Central Statistical Bureau will be carried throughout during the period of the Plan on the budget of the Plan Organization. It will, however, remain a permanent part of the governmental organization and, at the end of the Seven Year Plan, will be transferred to a strong central position, preferably with the office of the Council of Ministers.

Aim, Powers and Functions of the Bureau

The Central Statistical Bureau will have four principal aims:

1. To exercise co-ordinating technical control over the statistical sections of all other Government Departments, in order to insure that they are properly reorganized, employ comparable methods and are generally efficient.
2. To take over completely from Ministries certain basic statistics involving either higher mathematical techniques or the use of punched card machines. The basic statistics will be received by the Bureau, the servicing work carried out and the results returned to the Ministry.

3. To receive from Ministries statistics which have already been tabulated, compiled and even analyzed, but from which it is necessary to produce certain secondary derived statistics which either involve specialist technique or have to be carried out on the statistics of two or more Ministries.
4. To receive from Ministries copies of all completed statistics produced by any Government Department, so that the Bureau will act as a collection, co-ordination and publication center and as an "exchange and mart" for the passing of statistics from one Ministry to another. In this connection, the Bureau will be the sole correspondent with international bodies on statistical matters and the representative of the Government in the statistical work of such agencies.

In order to carry out these aims, the Bureau must be invested with the power of technical control over all statistical sections throughout the Government, though it will not interfere with their relationships with their own Ministries, nor with their day-to-day problems. The Bureau will have power to insure the efficiency of all sections, by either inspection of the issued statistics and their sources, or periodical surveys of methods. It will be empowered to issue standard definitions and to express its views through the agency of regular conferences of statistical officers, which can be called within the framework of the present Council of Statistics. It will be laid down by decree, that unless specially authorized by the Bureau as a regular routine, no Government Department requiring statistics from another shall refer direct, but must make its request through the Bureau, which may well be able to answer from its own resources and can, in any case, insure that the request is properly made. It may be, for example, that the information is better available in some other place than the Ministry to which the inquiring department would have addressed itself, or that the request itself is an impossible one. The Bureau should also be empowered to represent the Government of Iran in all international statistical relations and correspondence.

The specific functions of a Central Statistical Bureau, therefore, will be:

1. to receive figures from all Government departments for record and further analysis if necessary;
2. to calculate secondary-derived statistics from figures already completed by Government departments, and in particular all derived statistics based on the data available in two or more departments;
3. to take over certain basic statistics for servicing in the punched card pool;
4. to issue a Statistical Digest, at first quarterly and then monthly, and, in addition, to issue an annual Statistical Abstract with a commentary;
5. to publish occasional series of statistical and economic studies;
6. to act as an "Exchange and Mart" for all statistical enquiries in the Government;
7. to conduct correspondence with UNO and other international agencies and representation of the Government in statistical matters on any such bodies;
8. to exercise technical control over the statistical sections of all Government Departments in their day-to-day work and to check all their figures by means of an inspection team;
9. to apply the reorganization schemes under the Seven Year Plan for statistics;

10. to provide all statistics required by the Plan Organization;
11. to publish a booklet of definitions and units (see that produced by the Central Statistical Office of Great Britain);
12. to maintain a chart room for the Plan Organization and Council of Ministers;
13. to establish a card index of all statistical sources and returns taken in and by all Government departments in order to check duplication;
14. to maintain a statistical library.

In connection with this work a start can be made by taking over the body of statistics held by the present statistical office of the Plan, which itself will be the nucleus for the Bureau. These are at present, in general, the type of statistics mentioned in (1) above. It will be necessary to make many more analyses of these than have been done, both by taking into account old figures, for example, the ten-year-old survey of the Bank Melli, by improving the system of record and maintaining card indices, and by the calculation of ratios. Thus, in the case of industrial statistics, it should be practicable to calculate the ratio of capital to labor, to set capital or labor against production; or to compare the costs of manufacture of certain products, as against the c.i.f. importing costs. It should be possible to ascertain the faults of the financial figures; to produce density maps for population; to make some calculation even on the incomplete mortality figures now existing; to investigate figures of deaths by accident; to increase the public health figures collected, and the like. Only in the case of the agricultural figures is a decrease in work recommended, for it is thought that the production of papers, such as the two already issued, should pass to the agriculture estimation service proposed in the Ministry of Agriculture; if necessary, a specially-trained staff can go with the work.

Lay-Out and Staff of the Bureau

It is recommended that the Bureau be placed under an Iranian Director, to whom will be attached a foreign adviser, who will be able to give valuable assistance through his knowledge of statistical techniques in other countries. The budget for this Advisor should cover the whole period of the Seven Year Plan, though he may not in fact be required for all this time. He should be paid a salary of $8,000 per annum, plus a substantial allowance in rials. This may need to be even as much as Rls. 15,000 or more per month, in addition to his salary, in order to attract a man of the very highest level. To this must be added a sum for his traveling expenses, leave, leave travel, contingencies, and so on. Under the Director there will be three main offices, namely, the Machine Pool, the Deputy Director, who will control the technical side, and an Administrative Officer, of comparatively junior rank, who will control the typists, files and registry. The machine pool will require a foreign supervisor for the whole period of the seven years, whose salary may be about $4,000 per annum, plus an allowance of about Rls. 10,000 per month. He will have an Iranian deputy, who will gradually learn this extremely complex technical work and may succeed the foreign supervisor at an earlier date. It should be noted that this supervisor must be given executive powers; with the exception of the supervisor for the census machines, he is the only foreign specialist who is recommended in this report in other than an advisory capacity. A staff of about 16, mostly girls, will be required for the pool; it is very strongly recommended that girls should be employed as they are superior to men on this work. The installation should consist of at least four punches and four

verifiers and at least one automatic punch. There should be a counting sorter, a tabulator, with equipment for producing summary cards, an interpreting machine, which reproduces on the card in brief the meaning of the holes, and the two machines known as reproducers and interpolaters, or their equivalent.

The Deputy Director will control two groups of sections:

1. A Statistical Information Center, which might be called by a composite name equivalent to the English "Statscentre". This center will be concerned with answering inquiries, correspondence with UNO, editing and publication and maintenance of the chart room. It will probably require a staff of about eight and will be directly controlled by the Deputy Director.

2. A Technical Section which will be under a Technical Director, himself under the Deputy Director, and which will be concerned with the intake of figures from the Ministries, in the finished form for handing on to the Statscentre or for mathematical analysis by the Technical Section itself, or in the raw state for check before passing to the machine pool. Return of figures to the Ministries after machining will also be through this Technical Section, which will perform all the analytical work and so forth on any figures passed upwards to the Statscentre, or downwards to Ministries. It is also through this Technical Section that technical control and advising on methods will be exercised in regard to the statistical sections of Ministries. There should be six technical subsections, namely:

   a. Physical and Demographic
   b. Social (Labor, Education, Health, etc.)
   c. Natural Resources (Land, Water, Agriculture)
   d. Industrial Production
   e. Trade and Transport
   f. Finance

A small Inspection Section will also be attached to the Technical Director.

Attached to the Statistical Bureau there will also be for a period a foreign adviser on statistical organization, whose duty it will be to assist in the reorganization of statistics under the Seven Year Plan, and his small staff.

Relationship of Central Statistical Bureau to the Ministries in Regard to its Detailed Work

Under the major head—Detailed Discussion and Recommendations—of this report, statistics have been dealt with by subject and detailed recommendations made. Action by or in conjunction with the Central Statistical Bureau has been frequently recommended. If summarized this gives a convenient picture of the statistics which will be received by, analyzed by, or machined by the Bureau. The fourth aim of the Bureau set out earlier is, it will be remembered, the technical control of statistical sections. This also can be to some extent summarized. Exhibit P-11 sets out in summary against each of the heads of this section the statistics which it is recommended should be dealt with by the Central Bureau in any of the four ways.

Taking the example of the Ministry of National Economy, Exhibit P-12 shows the relationship between a typical Ministry, its sources of statistics, and the Central Statistical Bureau. The numbers 1, 2, 3 and 4 refer to the functions as numbered in the columns of Exhibit P-11.

Budget

Rls. 55,660,000 have been allocated for the Central Statistical Bureau for the life of the Plan (see Exhibit P-6). These funds (as well as Rls. 25,000,000 for the Census of Population) will be drawn from the Rls. 300,000,000 originally allocated to "Topographic Mapping and Statistics". (As stated earlier, Rls. 42,633,000 have been reallocated from "Agriculture" to "Statistics").

1. In general it will be the function of the Central Statistical Bureau either to initiate action directly on this section of the report (if it is accepted), or, when the action is of such a nature that it lies with a Government department to initiate it, to insure that this action is taken and to advise on its progress. For this purpose the foreign adviser on statistical organization will be employed for a period of one year or 18 months to advise on the execution of the work which this section surveys and recommends. This appointment must therefore be made very early, and it will be immediately followed by that of the foreign adviser to the Central Statistical Bureau proper and by the drafting and passing of the law establishing the Central Statistical Bureau and giving it its powers. The adviser to the Plan on statistical organization will have a very small staff and a special office which will be attached to the Central Statistical Bureau. He will start to function even before the Bureau does, for he will be, to some extent, responsible for advising on its lay-out. Each department will then take action on the recommendations specially concerning it as given in the body of this section under Detailed Discussion and Recommendations. It will do this in conjunction with the adviser on statistical organization, who to some extent will assist in timing the steps. When, however, statistical action is linked to any larger scheme within the Seven Year Plan, for example, the setting up of the meteorological service or water authority, the initiation of action will have to come from the more important scheme.

2. It is suggested that the steps in the order of priority for the earlier period of the Plan should be as follows (it should be borne in mind that it is not possible to phase definitely over the seven years such detailed matters as statistical organization; and indeed the whole of the reorganization of Government statistics must take place very early in the Plan):

Step 1—Appointment of the adviser on statistical organization and selection of his two or three assistants.

Step 2—Appointment of the three principal advisers recommended, namely, Census, Agriculture and Central Statistical Bureau.

Step 3—a. Build-up by the Census Department of the census organization.

b. Build-up of the agricultural estimation service.

c. Passing of Law of Statistics and setting up of Central Statistical Bureau.

All these three will be carried out in liaison with the adviser on organizations.

Step 4—Initiation of action on statistical matters connected with other high-priority schemes in the Plan, for example, water resources statistics.

Step 5—Establishment of the numerous commissions recommended throughout the body of the text (under Detailed Discussion and Recommendations) for the study of difficult problems.

Step 6—Appointment of the adviser on cost-accounting.

Step 7—Commencement of action in turn on the recommendations made by each responsible Ministry.

Step 8—The installation of punched-card machines in the Central Statistical Bureau, Customs statistical section and Census (ordering will have taken place much earlier).

Step 9—Implementation of recommendations for punched-card indices.

Step 10—First publications by Central Statistical Bureau.

Step 11—Taking of the Census.

3. In conjunction with the above program there should be organization of classes for training statisticians, the establishment of a statistical cadre, the allocation of special rates of pay, and the reorganization of the Council of Statistics to enable it to be used as one of the means for the exercise of technical control by the Central Statistical Bureau. Attention should also be paid to the possibility of obtaining assistance from the United Nations as envisaged in the report of the fourth session of the Statistical Commission of the United Nations, which dealt with the development of national statistics.

4. It is not desired to include here a draft of a Law of Statistics, though this has in fact been sketched out for the purpose of co-ordinating the recommendations made in the foregoing section. It is necessary, however, to point out that such a Law must include statement of:

a. the functions of the Central Statistical Bureau as set out above, and in particular its powers;

b. a general scheme of the statistical organization throughout the Government;

c. a statement of the power of co-ordination exercised by the Central Statistical Bureau;

d. an establishment of the powers of statistical sections and of the Bureau to ask any individuals, governmental or non-governmental institutions in Iran to supply statistical information relating to their activities;

e. the affirmation of the secrecy of individual returns;

f. the prohibition by the use of statistical officers of any information for their personal interests;

g. the safeguarding of individuals rendering statistical information from any civil or criminal proceedings based on the evidence of the statistics, except proceedings against those giving false information.

5. In statistical organization it is not easy either to allocate expenditure to particular years or to divide it between the ostans of the country. The requirement, therefore, that the expenditure of the Plan be spread to some degree over ostans is very difficult to comply with, or at least demonstrate in the statistical field. Practically all the expenditure, for example, on the Central Statistical Bureau will be at the Government headquarters in Tehran, and this expenditure must be regarded as attributable to the general Plan overhead. The expenditure of the Agricultural Statistical Section and the Census, the other two large specific statistical expenditures, will be partly spread over the provinces in virtually equal proportions, but it is impossible to state at the moment how much will go to each province, and it is clear that in both cases there will still be more expenditure at the center. The bulk of the other statistical expenditures recommended is in the headquarters of the Government offices.

In the same way, it will be readily seen that it is very difficult to separate statistical expenditures for each of the seven years. The great majority of the statistical expenditures recommended will fall about the second year of the Plan, for it is obvious that the sooner some good statistics are available the better for the running of the Plan.

No attempt, therefore, has been made to draw up a summary of total statistical expenditures divided by ostans and years. Such an attempt would be further complicated by the fact that most of the statistical expenditures are attributable as administrative overheads to other sections of the Plan, and some indeed must be found from the ordinary revenues of the departments concerned, the only reason for putting the recommendations in the Plan being the need for overall co-ordination.

6. Certain of the text under the main head, Detailed Discussion and Recommendations, is not relevant to all Government Departments. The chief departments concerned with action and the recommended source of the budget, therefore, are shown in Exhibit P-13 for each of the subjects dealt under the above-mentioned head.

DISTRIBUTION

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DISTRIBUTION

SCOPE OF THE STUDY

If the benefits of increased production of goods are to be realized by the country as a whole, adequate facilities must be provided for the free flow of such goods from producer to consumer. In a primitive economy, this operation is very simple; as the economy becomes more advanced and larger areas are embraced within it, distribution becomes a complex process, involving among other elements: assemblage, storage, transportation, financial credit, and the various categories of middlemen, so called because they stand between producer and purchaser as intermediate buyers and sellers.

Since an efficient distribution system is necessary to bring the benefits of increased production to the consumer, this section of our report is devoted to (1) a study of the distribution system of Iran today with respect to the principal articles of commerce, (2) a study of the export trade situation, (3) recommendations with respect to distribution policies and programs to achieve the objectives of the Seven Year Plan, and (4) recommendations for implementing these policies and programs by the Plan Organization.

The form and workings of a nation's distribution system are conditioned by its geography, economy, and society. Therefore, a basic investigation of these factors was made at the outset of the distribution study.

Major effort was made to gain an understanding of the general patterns of distribution in Iran. This procedure was made necessary because of the almost complete lack of essential statistical data and information regarding distribution. The technical problems of distributing the many specific commodities which make up a nation's commerce are so varied as to be logical subjects for intensive, detailed study, not possible in the time available to us; this study should, however, be a major task of the Plan Organization. Our studies were devoted chiefly to such products as wheat, bread, milk and milk products, fresh fruits and vegetables, sugar, tea, tobacco, meat, textiles, kerosene and other petroleum products.

Special attention was paid to the nation's distribution structure and to the manner in which essential distributive tasks are currently performed. The marked degree to which Government and its agencies participate in distribution in Iran made a careful study of this matter advisable. Various forms of co-operative effort were examined because of their seeming potentialities as aids to production, purchasing, financing, and marketing. Trends in export trade were analyzed and a study was made of the principal problems of export trade practices.

Information was gathered principally by conferences, interviews and observation; few statistial data were available. In addition, the reports and analyses furnished by members of the Provisional Planning Board staff were most helpful. Work was concentrated in Tehran, because Government and a substantial portion of the nation's commercial activity center there. Field investigations also were conducted, principally in Ostans 1 and 2.

THE FIELD OF DISTRIBUTION

Distribution is concerned with the activities and institutions necessary to effect the flow of goods and services from producers to consumers. It deals with both their physical movement and the transfer of their ownership, each of which creates its own special problems. It is concerned equally with raw commodities, semi-finished and finished goods, imported and domestically produced products, and goods moving into export trade.

The work of distribution involves the performance of certain fundamental processes and activities which are common to all but the most primitive economies. The effectiveness of a nation's distribution system depends upon the existence of adequate physical facilities such as storehouses, grain elevators, railroads and highways, and upon the amount of knowledge, skill, sound practice and integrity applied in performing the necessary tasks.

THE TASKS OF DISTRIBUTION

The functions of distribution tend to become more and more specialized as the economy becomes more complex. Some of these functions are:

1. Assemblage of small quantities of one or more commodities from a number of small producers, in order to achieve the economies of dealing with large quantities.
2. Storage, represented by commercial storehouses or grain elevators located near production centers or at other strategic points.
3. Transportation, in all its forms, between producer and consumer.
4. The wholesaler or jobber, who buys goods in large quantities and keeps them in supply for sale to retailers in a limited area. The wholesaler performs an important function by keeping a supply of goods at a convenient distance, he makes it unnecessary for individual retailers to carry inventories much larger in the aggregate, and at the same time prevents price fluctuations caused by unexpected shortages.
5. The retailer, from whom the goods pass to the consumer.
6. The commercial bank, which by granting credit, finances the movement of goods on their way from producer to ultimate purchaser and allows the producer to be paid for his product long before (in most instances) it reaches the consumer.
7. Insurance, which minimizes the risk of physical loss of goods, and of radical price fluctuations.

A by-product of all these activities is the acquisition of considerable information about market conditions such as supply and demand at various points and the fluctuation of prices. In most advanced communities this information is systematically gathered, compiled and made public, either by trade associations or government agencies. This function is valuable to all concerned in the distribution process, as well as to producer and consumer. It directs the flow of goods to points of greatest demand and prevents markets at other points from becoming glutted, and in other ways contributes to the efficiency of the whole process.

There are numerous variations of, and additions to, the relatively simple list of functions set forth above. The import merchant buys goods from abroad and sells them, usually, to wholesalers or retailers. The broker neither buys nor sells for his own

account, but devotes his efforts to bringing buyers and sellers together on a commission basis. The commodities exchange permits purchases and sales against future delivery. The storehouse and grain elevator are used not only to store goods awaiting eventual consumption, but also by producers awaiting a better price for their product. Storage is also sometimes associated with intermediate processing or packaging.

FACTORS AFFECTING DISTRIBUTION

The distribution system of Iran has never been extensively developed on a nation-wide basis, and is defective in other respects, as will be brought out later. For this, two factors are primarily responsible.

The factor first in importance is the character of the country, which is essentially mountain and desert. Areas with water supply sufficient to support an extensive population are relatively few, and are widely scattered over the country. Thus, with an area larger than France, Italy and Spain, which together support a population of 115,000,000 persons, the population of Iran is only some 18,000,000. Furthermore, the mountain ranges and deserts form difficult obstacles to communication between the arable areas. As a result, therefore, each extensive arable area grew up as an economically self-sufficient unit, and only within recent years has there been any appreciable exchange of goods between them. No highways capable of handling motor traffic existed twenty-five years ago, and the railroad from the Persian Gulf to the Caspian Sea was completed only in 1317 (1938).

The second factor which has limited the growth of an extensive distribution system has been the low productivity of the agricultural worker. When a tiller of the soil can produce little more than enough to feed his family, the results are: first, that most of the population is bound to the land; and second, that there is a relatively small proportion of goods which is available for general distribution.

Based on the best available estimates, three-fourths of the entire population is rural, about one-eighth of the people are concentrated in 17 cities of 50,000 persons or more, and there are some 48 smaller cities ranging between 10,000 and 50,000 persons.

Thus we have an economy predominantly rural. The fact that there are huge exports of petroleum products does not alter this situation materially, except that, along with relatively small exports of native products, it supplies the foreign exchange for the sugar, tea and wearing apparel which the country does not produce in sufficient quantities to meet the needs or desires of the people.

The comparative self-sufficiency of the population, on the one hand, and the small surplus production, on the other, have naturally discouraged any ambitious schemes for distribution or merchandising, and there are no large establishments, even in Tehran.

Another factor which works against an efficient distribution system is the lack of adequate transportation. To and from the rural areas, the donkey or the camel are widely employed, and many villages are far from a reasonably good road. The highways are generally poor, causing slow speeds and heavy wear and tear on motor vehicles, and consequent high cost of transport. The railroad, as completed to date, serves a relatively small proportion of the country, and because the terrain is difficult and the distance between centers of population is great, the transportation cost is high. This applies to all movements, but is particularly striking in the case of petroleum products and imported goods moving from Persian Gulf ports to Tehran and population centers to the east, west, and north of Tehran.

For example, about 43 per cent of the retail price of kerosene represents transportation cost, which is equalized to all consuming points. The transportation charges on agricultural products shipped to the ports for export are estimated at about one-third of the wholesale price in Tehran. Transportation costs are a serious deterrent to the export of nuts and dried fruits through the Gulf ports, although there was formerly a profitable movement of these commodities to Europe through Russia.

Although it is hoped that transportation costs can be considerably reduced through the operation of the Seven Year Plan, they will always be comparatively high, and thus the separate population areas should remain reasonably self-sufficient. On the other hand, the general increase in agricultural and industrial production contemplated under the Plan will necessarily call for a better integrated national economy with consequently increased transport of goods, so that every effort must be made to make transportation less expensive.

In the meantime, however, generally poor transportation of goods, with frequent stoppages from winter rains and snows, continues to aggravate the constant local shortages and the price fluctuations brought about by marginal production.

Still another hindrance to the orderly distribution of agricultural products is the almost complete lack of market information available to the village producer. Not only is such information not compiled and published, but if it were, communications by any medium are so poor that it would be only of historical value when received. It is essential that communications generally be greatly improved if distribution is to be put on an efficient basis.

The general problem of distribution is complicated in another way, namely, by the active participation of Government. This no doubt came about because of the dependence of the population on certain imports, such as cotton goods, sugar and tea. The Government, anxious to control imports and make the economy more nearly self-sufficient, financed the construction of factories to manufacture cotton goods and sugar, and has made the sale of sugar and tobacco a Government monopoly, as will be described later. It has also interested itself in the distribution of grains and of tea, as will also be described later.

To summarize, therefore, there have been certain serious impediments to the growth of a well-rounded, efficient distribution system in Iran. The low average production of the person engaged in agriculture, the topography of the country, which has caused a wide separation of producing areas and placed mountain and desert barriers between them, the lack of adequate transportation, and the absence of adequate, widely disseminated market information, coupled with the injection of Government activities in various fields, have all handicapped the free and orderly flow of goods.

To provide an incentive for private individuals and private capital to enter the field of distribution it will first be necessary to increase the production of goods to the point where much greater quantities will pass into trade. This is a major purpose of the Seven Year Plan.

Topographical characteristics cannot be eliminated, but their effect can be lessened by more efficient transportation media. Other existing handicaps will be lessened or removed by the operations under the Plan (communications, for instance) and by the efforts of the Plan Organization to work out a cohesive system.

GENERAL PATTERNS OF DISTRIBUTION

Most storage facilities in Iran are primitive and inadequate, and a relatively high percentage of loss must result from their use. The facilities of the Government grain elevators are largely incomplete and adequate storage facilities for free market grain do not exist. Storage facilities for leaf tobacco after curing are inadequate. Improper storage of fresh fruits and vegetables at the retail level results in a high percentage of loss.

The absence of suitable marketing and processing facilities tends to restrict the agricultural area devoted to some of the nation's important "money" crops, that is, crops from which a relatively high cash income can be secured. Processing and packing facilities are inadequate for fruits, citrus, and dates. Packing and disinfection facilities are required for raisins and other dried fruits and nuts if the export volume of these commodities is to be increased. There are almost no canning facilities in Iran. Likewise there are no facilities within the country for the pasteurization of milk and the sanitary preparation of milk products.

Facilities for the standardization and grading of agricultural products are sorely needed. An unfortunate result of this lack is a widespread tendency toward adulteration of products, a tendency which is encouraged by the practice of the Government to purchase commodities, such as wheat, at less than prevailing free market prices. Adulteration is so common that it is the stated practice of buyers to allow for it by reducing the prices they pay by as much as 20 per cent.

Credit facilities for financing commerce and trade, especially in the smaller towns and villages and in the case of small business enterprises, are inadequate to meet the needs of an expanding distribution system. Interest rates are high; the bazaar rate is frequently quoted as high as 35 per cent or more. Yet according to some informed persons, approximately half of the loanable funds available for trade emanate from the bazaar rather than from the banking system. Development of a program for credit extension at reasonable rates is necessary through a more vigorous and competitive banking policy and possibly through the establishment of certain forms of co-operatives. This is a matter which must be approached with considerable care, and a certain amount of experimentation is called for.

Determination of market prices seems to be haphazard. The bazaar reacts quickly and often violently to changes in Government regulations and to the rumor of impending changes. Shifts in the supply position are discounted far in advance and often more than is warranted. In 1327, for example, imports of cotton piece goods were exceptionally heavy, and were rumored to equal a full year's supply. Prices naturally fell, but early in 1328 the Government reduced the rial import quota for piece goods by two-thirds, and the bazaar price rose 15 per cent during the first ten days following the new quota's announcement, although stocks were still plentiful.

The fluctuation of commodity prices, and the relationship of wholesale to retail prices are subject to wide variation as may be seen in Exhibit Q-1, compiled from data furnished to us by Bank Melli. It shows the reported wholesale and retail prices of three basic food commodities, tea, cheese, and sugar, and the percentage by which retail prices have exceeded wholesale prices at various seasons during the period from 1324 to 1327, inclusive.

With a well-balanced, efficient system of distribution such wide fluctuations, especially with regard to the spread between retail and wholesale prices, could not take place.

They can occur only when supplies are so scarce that the slightest change, or rumor of change, in market conditions will produce a violent reaction in prices, or when up-to-date information of market conditions and price movements is not disseminated or properly understood. Market statistics, such as are readily available to business men in the United States and elsewhere, do not exist. The Bank Melli publishes some information with respect to a few items, but this information, it is reported, is not widely or quickly disseminated. In this connection it is important to note that the communications facilities of the country are completely inadequate for the needs of commerce and trade and fail completely to provide satisfactory means of commercial contact or for the interchange of commercial information. There is no evidence of the use of market research or scientific forecasting as aids to distribution or indeed of any significant appreciation and understanding of modern distribution techniques.

CHANNELS OF DISTRIBUTION

Under conditions such as are outlined above, it is quite understandable that no formal pattern of distribution exists in Iran. The lines of demarcation between successive stages of distribution from producer to consumer are not clearly definable. The opinion seems to be commonly held in Iran that there are too many middlemen. This is a term somewhat loosely applied, but, in the sense that in many instances goods pass through too many hands before reaching the consumer, the statement is true. On the other hand, our studies have convinced us that, as far as wholesalers in the strict meaning of the term are concerned, there are too few of them rather than too many and the function of wholesaling is relatively undeveloped. As a result, so many transactions may take place before goods reach the consumer that the spread between the price received by the producer and that paid by the consumer is far too great. This is particularly true with respect to agricultural commodities. Further, because many of the so-called middlemen are, in fact, merely speculators who naturally take advantage of local shortages and surpluses, wide fluctuations in price are common.

A few examples will suffice to illustrate this condition. Distribution of fresh fruits and vegetables in the Tehran area is from producer to broker, to retailer, to consumer. A large producer may retain a broker to act as his agent, at a commission of from seven to ten per cent. Small producers must pay higher commissions. Secondary brokers also exist. They buy from primary brokers and supply their regular clientele of perhaps 40 small shopkeepers and pushcart peddlers. These secondary brokers extend credit to their customers and thus control their business. It is stated that an informal combination exists among brokers whereby it is almost compulsory for producers of fruits and vegetables to dispose of their goods in a single area of this city. This would have the effect of placing the retailers in such area under the complete domination of the broker in the matter of prices.

Milk distribution varies with the requirements of the particular area. In the Tehran district, milk is usually collected from cattle owners and sent to the butter shops. Here butter fat is extracted and the residue milk sold to retailers and milkmen. There are two principal grades of milk: pure milk selling at about Rls. 12 per liter, and a mixture of pure and residue milk selling for Rls. 4 per liter. There also is price fixing by the municipal authorities which seems to have little relation to supply, demand, or quality. The price received by the cattle owner for his milk is in the neighborhood of Rls. 7 per liter.

Ghee, cheese, and other milk products are produced mainly in areas removed from the larger cities. Most of the processing is done by dealers, who buy from milk producers and then sell their products either directly to consumers or else to retailers in more distant cities.

A price spread of 100 per cent between producer and consumer is common for agricultural commodities, and marked price fluctuations seem to be the rule. The price of wheat, for example, may vary 60 per cent or more during a season, and fresh fruit and vegetable prices may fluctuate by as much as two-thirds of the peak price. The generally small surpluses available at any given time and place, together with the difficulties of transportation and storage, undoubtedly are responsible for this situation.

That there is no formal pattern of distribution of manufactured goods is shown in the methods followed in cotton piece goods. With respect to private manufacturers, distribution is usually from manufacturer to retailer to consumer, with the import merchant supplanting the manufacturer for imported piece goods. The Industrial and Mining Bank acts as sales agent for the Government textile factories, selling to merchants who, in turn, sell either to consumers or else distribute their products more widely through retailers, or sometimes through wholesalers. The Bank also exercises a large measure of direction over the type and quality of merchandise which shall be produced by the various Government factories.

THE BAZAAR

The bazaar is probably the oldest distributive institution in the world and constitutes an amazing integration of production, wholesaling, and retailing. Because it still dominates distribution in Iran, it merits some consideration.

A large city bazaar is the principal point of assembly, storage, and dispersion into smaller lots for goods which move in trade. It is both a wholesale and retail institution, and is departmentalized to a remarkable degree. Merchants and shopkeepers specializing in one kind of goods concentrate in one section of the bazaar, while those dealing with another class of merchandise concentrate in another. In this aspect, the bazaar remotely resembles a large modern department store. But whereas the department store possesses the advantages of large-scale operation, the bazaar suffers from all of the disadvantages of small-scale operation. Indeed, the generally small scale of distribution and of middleman operation in Iran is probably one of the most important factors contributing to high costs and relatively low efficiency.

The bazaar also is an important source of commercial credit and a principal source of market information. Fact and rumor pass quickly from shop to shop and tacitly-agreed-upon common action is taken as a result. In times of rising prices and comparative shortages of merchandise the bazaar thus becomes a highly effective mechanism for the joint raising of prices to the advantage of the shopkeepers. It is reported that whenever wages have been increased in recent years bazaar prices immediately have been raised by an equal, or even greater amount.

Viewed as a distributive institution, it is highly improbable that the bazaar can meet the needs of modern distribution. Its many small shops are not efficient business units. Their aggregate inventories are more than are necessary to sustain trade, and financing them adds to distribution costs, while at the same time they contribute to the inflexibility of the entire distribution system. Goods move slowly, as is evidenced by the

fact that, four years after the recent war, prewar German pharmaceuticals were still being sold in the bazaar. Low turnover, emphasis upon maximum profit per individual transaction, and excessive reaction to price and supply changes are indicative of a generally low level of knowledge and skill concerning sound distribution practices.

An age-old institution such as the bazaar changes but slowly, and then mainly by the force of outside competition. It is significant with regard to this point that, wherever modern streets have been laid out in towns and cities, new and better shops have been established. Some of these seem to be well-designed and to be operated along more progressive lines, but today there are but few of them and they deal mainly with luxury and higher-priced merchandise. However, they are an indication of breaking with ancient custom and of a force which tends to dilute the influence of the bazaar.

THE VILLAGE

In the villages, where the great majority of the people live, the peasant is but little exposed to articles of commerce generally, except in a poorly-stocked village store or on occasion of a peddler's visit. With a higher level of production and consequent higher income to the peasant, there should be a great expansion of this village market, since the villager today is doing without what in most countries would be considered prime necessities of life.

There is little actual money in the villages and most transactions are by barter. Since the merchant or peddler generally has no competition, the villager is pretty much at his mercy.

THE ROLE OF GOVERNMENT

Government participates in distribution by reason of its monopolies and Government factories through the quasi-monopolistic methods which it has devised for the distribution of products such as wheat and tea, and by the regulations and taxes imposed upon commerce. The Government's present participation in distribution arises principally out of two factors: the fact that the original industrialization of Iran was almost entirely a Government venture; and the later need for the Government to attempt to guarantee the availability of sufficient stocks of essential commodities.

Government monopolies originally were created as marketing devices but, with the passage of time, several of them have become such important sources of revenue that they must be considered in this light as well as to their effect upon distribution. Two monopolies in particular, tobacco and sugar, merit close examination.

Income secured from the Government monopolies, principally those on tobacco and sugar, is second only to that derived from customs. In 1326 the monopolies accounted for 26 per cent of all Government revenues.

Tobacco Monopoly

This monopoly buys all tobacco produced in Iran and sells all tobacco products. It licenses growers to raise tobacco and buys their crops at fixed prices. Average prices in 1327 were as follows: cigarette tobacco, Rls. 25 per kilogram; pipe tobacco, Rls. 14; and water pipe tobacco, Rls. 11. Tobacco is the leading money crop of Iran upon the basis of return per hectare; the average annual return to the grower is estimated to be Rls. 37,500 per hectare. Growers are politically powerful and the monopoly is under constant pressure to increase the hectarage under cultivation, regardless of carry-over stocks or estimated demand.

The monopoly buys the crop through agents. It stores, cures, and processes it; and distributes the products to warehouses in various parts of the country, where a one to two months' supply is kept on hand. Representatives of the Ministry of Finance undertake distribution where the monopoly has no warehouse facilities. It is difficult to secure transportation during some seasons, and the monopoly has now under consideration the establishment of its own transport system, which could also be used to haul grain and sugar.

Distribution is effected through wholesalers and retailers to buy from the monopoly and resell at fixed prices and under fixed margins. As well as can be estimated, distribution costs and margins for a package of 10 Oshnoo cigarettes, which account for about 90 per cent of all cigarette sales, are as follows: The factory cost per pack is Rls. 0.5, and transportation costs are estimated at 5 per cent or an additional Rls. 0.025 per pack. The monopoly sells to the wholesaler at a price of Rls. 2.375 per pack; the retailer is charged Rls. 2.4; and the final selling price to the consumer is Rls. 2.5 per pack. The wholesaler therefore seems to work on a margin of about one per cent, the retailer on about four per cent. The monopoly's gross profit of Rls. 1.850, which covers both administrative costs and profits, is about 74 per cent of the retail selling price. It is estimated that in 1326, the monopoly paid growers Rls. 273,000,000; expended another Rls. 279,000,000 for collection, transportation, processing, and administration; and ended the year with a profit of Rls. 1,000,000,000 or about 64 per cent of gross receipts.

The monopoly's pricing experience of recent years is of interest with its present marketing problems. In 1326 the price of Oshnoo cigarettes was raised and production dropped from 3,550,000,000 to 3,060,000,000 cigarettes. The price was subsequently gradually lowered in 1327, and production is estimated to have increased to approximately 4,000,000,000 cigarettes. It is obvious that the demand for cigarettes is elastic and responds quickly to upward and downward revisions in price.

The principal problem facing the monoply today is the fact that it possesses a stock estimated at 30,300 metric tons, the largest carry-over stock of tobacco in its history, with a similarly large carry-over predicted for 1328. This is in contrast to a carry-over of 2,000 tons in 1318 and 7,600 tons in 1321. The present surplus is comprised of 16,000 tons of pipe tobacco, 9,000 tons of cigarette tobacco, and 5,000 tons of water pipe tobacco. It also is estimated that, if the monopoly had not restricted the 1326 harvest to 68 per cent of the previous year's hectarage, the carry-over might have mounted to 37,000 metric tons.

Such a large surplus supply obviously is uneconomic and its possession represents a dubious asset. The question, therefore, arises as to how it came about and what can be done to co-ordinate supply more closely with demand. Implied also is the question of whether the monopoly's marketing policies have been designed to produce the maximum net revenues.

In addition to reducing the hectarage, the monopoly has sought to reduce its surplus by attempting to sell a portion of it in foreign markets. It is reported that some foreign inquiries have resulted, but that the price of Iranian tobacco has been uniformly the highest in the world market. It was stated by one authority that the monopoly had offered its product at a price of Rls. 270 per kilogram in the face of the Turkish price of Rls. 70. The monopoly contends that its operations are small and that it therefore cannot compete with Turkey, whose economy is shaped to producing tobacco for the world market. According to latest available information, however, the monopoly's present carry-over is almost exactly equal to Turkey's average annual exports.

It is unlikely that, except for water pipe tobacco, exports will provide an outlet for any substantial surpluses on a long-run basis. On the other hand, it is possible that realistic pricing designed to liquidate present excess stocks can help to relieve the situation. Further, the two-year surplus of cigarette tobacco, in view of present high gross margins and the proven elasticity of demand, suggests that the monopoly might be able to sell a substantially larger total volume of cigarettes and even increase aggregate profits, if it were to lower cigarette prices further and to engage in a certain amount of promotion. Such a policy, if put into effect in a limited market area under carefully controlled conditions and over a sufficient period of time, should furnish dependable information upon which a country-wide program could be based. Use of the "test market" procedure is simplified in Iran because of the small extent of communication between major economic regions. To prevent a recurrence of present excessive carry-overs, a policy of restricting hectarage devoted to tobacco in accord with the probable demand for various types is strongly indicated.

Sugar Monopoly

Sugar is one of the more important staples of Iranian life. Annual consumption since the war has averaged 135,000 tons, with the probability of increasing to 150,000 tons. Total stocks in 1326 amounted to about 200,000 tons, including carry-over. Domestic production was slightly in excess of 52,000 tons and imports amounted to more than 80,000 tons. A somewhat lower domestic production is predicted for 1328, so that correspondingly larger imports will be required.

The sale of sugar is a Government monopoly, operated by a department of the Ministry of Finance. Domestic sugar is purchased by the monopoly from the Industrial and Mining Bank, which operates the country's sugar plants, and is distributed to the public through approximately 1,200 agents and dealers, formed into a company for that purpose. The monopoly at present sells to the company at Rls. 15.1 per kilogram, while the company sells to the agents at Rls. 15.4. The agents and dealers, in turn, sell to the public for Rls. 17.0 per kilogram, including a one-rial municipal tax.

The monopoly transports sugar from the factories to its warehouses by rail, but claims it could reduce transport costs by one-third if allowed to do so by truck. Where the monopoly does not possess facilities, agents of the Ministry of Finance supervise the distribution.

There is considerable question as to whether adequate stocks are maintained in the different warehouses or at points of retail sale. In Meshed, for example, the monopoly states that supplies usually are adequate during the production season, but that shortages sometimes occur at other seasons. Supplies of sugar in some sections of Tehran recently have been short for several days at a time. It also is claimed by competent authority that supplies to villages are uneven and that, as a result, the price not infrequently rises to between Rls. 23 and Rls. 25 per kilogram. The monopoly admits that supervision of agents and dealers is probably inadequate and that buying and selling sometimes takes place between various regions in times of local shortage, with resulting temporary price increases.

The picture of price spreads and possible monopoly profits is more complicated than in the case of tobacco, due to the importation of some of the product and to the interjection of the Industrial and Mining Bank with regard to domestically produced sugar. With regard to domestic sugar the average production cost at factory is Rls. 11.6 per

kilogram including the addition of an overhead charge of Rls. 0.8 by the Industrial and Mining Bank. The Bank sells to the monopoly at Rls. 13.0 per kilogram or at a profit of Rls. 1.4, representing 12 per cent of the cost price. Recently sugar has been imported at a cost of Rls. 5.07 per kilogram cif plus unloading, to which must be added Rls. 3.61 for customs duties, road tax, monopoly and other taxes, bringing the total cost to Rls. 8.68.

Transportation cost to monopoly warehouses averages Rls. 2.0 per kilogram for both types of sugar; thus the total cost of domestically-produced sugar is Rls. 15.0 and for imported sugar Rls. 10.68. Based on the uniform sale price to the distributing company of Rls. 15.1, the profit on the domestic sugar averages 0.67 per cent of the cost and on imported sugar 41.4 per cent. All of the foregoing calculations are based upon the lower-priced granulated sugar. Cane or loaf sugar, which is in particular demand, sells for Rls. 5 more per kilogram. Inasmuch as its cost is only Rls. 2.0 greater than granulated sugar, the profit accruing to the monopoly is substantially greater.

From available information the sugar monopoly accounted for Rls. 700,000,000 of the Government's revenues in 1327. This is based upon a distribution of 150,000 metric tons of sugar of which, it is stated by competent authority, 30,000 tons were sold to the Army at no profit. Distributing the claimed profit over the remaining 120,000 tons at an average price of Rls. 16.0 per kilogram (less the one-rial municipal tax) would produce an average profit of 36.4 per cent of sales. This is in addition to profits secured by the Industrial and Mining Bank, or revenues accruing to the Government from municipal taxes, import duties, road tax and other monopoly taxes.

We do not agree with the monopoly's contention that the demand for sugar is relatively inelastic, and that substantially larger quantities could not be sold if prices were to be lowered. Careful study should be given to this problem. A larger volume at lower prices could produce larger aggregate profits and, in addition, would provide more people with an important article of food. As in the case of tobacco, this is a question which should be tested in a limited market area before being applied to the entire nation.

Over and above the greater net revenues which might be secured from tobacco and sugar, there is a further advantage to the policy suggested above; increased sales of these products at lower prices would draw off a portion of the new purchasing power which may be created by Plan Organization spending for labor and local materials, and therefore would tend to exert a deflationary influence.

Tea Monopoly

Tea is another important staple of Iranian life. Domestic tea production is estimated at about 7,500 metric tons in 1327 and has been increasing steadily since the war. Imports have averaged about 6,000 tons annually, with substantial fluctuations from year to year. Annual consumption of tea has averaged 10,000 tons since 1321, and in 1327 consumption rose to 12,000 tons.

Government participation in the marketing of tea dates from 1304 (1925) when the purchase, sale, importation, and export of tea and sugar became a Government monopoly. During the period 1316-1320 the Ministry of Agriculture was authorized to control the quality of home-grown tea, with a resulting improvement in quality and a corresponding decline in the average yield per hectare. Owing to tea rationing in India, imports of tea in 1322 were almost entirely by the Government, and domestic consumption was rationed until 1326.

The present form of control was established in 1325 when a Tea Office was created under the Ministry of Finance to purchase all home-grown tea at a fixed price. At the same time regulations were issued whereby merchants desiring to import tea were required to purchase one kilogram of the domestic product for each two kilograms imported. In addition, they were required to pay a monopoly tax of Rls. 5.6 per kilogram, plus one per cent of cif value on the imported tea.

This policy has had a number of unexpected repercussions. The greater income received by the tea growers has stimulated production; but since the Tea Office's control over quality has not been effective, the domestic quality has declined as yields have been increased. The poor quality of the domestic product has impelled many importers to avoid compliance with the regulations whenever possible. The result of the policy seems to have been to encourage domestic production at the expense of quality, and indirectly to levy a hidden charge on imported tea by the requirement of offsetting domestic purchases. The competitive position of domestic tea has not been strengthened.

GOVERNMENT REGULATIONS AND TAXES

National and municipal regulation of distribution is so varied and changes so constantly that it has been possible to examine it only in highlight. However, it merits future detailed study to determine the degree to which specific regulations hinder or help the successful execution of the Seven Year Plan. At this point, a few examples will suffice.

Late in 1327 a law was passed which provided that all goods imported with foreign exchange supplied by the Government should be put at the disposal of consumers with no more than a 15 per cent profit over the landed cost at Tehran. "Profit", as written into the law, seems to represent the total gross margin of importers and all other middlemen who may be necessary for the distribution of the goods.

Experienced persons claim that it is impossible for importers to live up to the letter of the law except by opening retail shops and selling directly to consumers. They maintain that the 15 per cent total gross margin does not allow a sufficient spread to permit distribution to wholesalers or even direct to retailers, since each of these middlemen must have his own gross margin if he is to remain in business. While it has been impossible to examine representative costs in detail, this contention seems sound and justifiable. If so, application of the regulation probably will either give rise to illegal distribution to wholesalers and retailers, or else to a contraction in the distribution of the commodities involved.

This regulation applies to a variety of commodities and creates problems for many of them. In the case of greatly needed agricultural machinery, for example, the 15 per cent gross margin is insufficient to cover the cost of maintaining a building for the housing and sale of machinery, keeping a supply of spare parts, investing in the necessary shop tools for servicing equipment, and employing a mechanic for that purpose. The regulation is an excellent example of ill-considered action which produces more harm than good.

Approximately nine per cent of the national revenues of Iran comes from indirect taxes. These taxes are mainly collected on the sale of commodities and therefore are represented in the price people pay. This applies equally to imports and domestically produced goods. Taxes, for example, represent 42.5 per cent of the price of kerosene distributed by bulk, and 56.4 per cent of the price of gasoline. Of the final retail price of imported sugar, 27.1 per cent is represented by customs duties, road tax, monopoly and

other taxes, and the municipal tax. Nevertheless sugar is a prime staple of Iranian consumption; kerosene is the most likely substitute for the charcoal and dried grasses, the use of which is daily destroying the forests and the plant cover upon which the nation's water supply so largely depends; and gasoline will become increasingly important to improved transport and lower transportation costs as highways are improved. The problems of public finance are not pertinent to this section of the report, but it must be remarked that high indirect taxes on essential commodities, by contributing to high prices, discourage general consumption and thus restrict expanding markets. It would seem desirable to re-examine both domestic taxes and import duties in detail to determine the effect of specific levies upon distribution and upon the consumption of desirable commodities.

THE DISTRIBUTION OF WHEAT

Wheat is the great staple of the nation and its distribution is so important to the economic and political stability of Iran that it merits special consideration.

Annual wheat production is about 2,000,000 metric tons; it is supplemented by between 800,000 and 900,000 tons of barley. Between two-thirds and three-quarters of the wheat is consumed where it is produced, so that only about 500,000 to 600,000 tons move into the market for general consumption. Certain areas in Iran are surplus grain producers, while others are deficit areas; and crop yields in surplus areas vary greatly from year to year. Local shortages frequently occur. Transportation and storage are so difficult that for many years private entrepreneurs have been unable or unwilling to undertake the task of distributing grain throughout the country. Therefore the function of grain marketing has devolved upon the Government. The need for sufficient carry-over stocks from one year to the other in strategically located centers throughout the nation is imperative.

There are three classes of producers: the peasant who raises grain mainly for his own use, the small farmers who produce partly for sale, and the large landowner who produces mainly for sale in the market. It is claimed that total production has declined in recent years, owing partly to the diversion of hectarage to more profitable crops such as sugar beets, fruits and vegetables, and partly to migration of labor to the towns and cities.

Storage and transportation facilities are primitive. Village storage is either in clay pots holding about 50 kilograms, clay bins holding around 500 kilograms, or in pit silos which are satisfactory only in dry weather. Some short-term storage takes place in or near the village markets. The so-called "Government wheat", to be described shortly, is stored first in temporary facilities and later in one or another of seven Government elevators with a combined capacity of 170,000 tons, only three of which are moderately well equipped to store and clean grain. Grading and standardization are almost entirely lacking and are much needed.

The goal of the Government has been to accumulate enough surplus wheat to permit a carry-over from one crop year to the next of from four to six months' requirements. Wartime inflation introduced a second objective, that of providing cheap bread for city dwellers. This latter policy has not been extended to the villages, probably due to the impracticability of doing so.

Government participation in grain marketing began in 1311 (1932) when the Majless enacted a law providing for the establishment of grain storage facilities in Tehran and for

the purchase of grain to meet the city's emergency needs. In 1315 crops were so plentiful that Government intervention was necessary to support the market. A Government company was formed to purchase wheat and cereals and an expanded storage program was planned to include 22 elevators and 8 cleaning plants. Government purchases at this time were above the free market price. The purchasing plan continued until 1322, but the expanded storage program was dropped because of a decline in crops.

Since 1322 the Government has set an arbitrary price for grain considerably below the free market price and has required landowners to deliver a specified percentage of their surplus at this price. The law currently reads that a landowner must pay a tax in grain equal to 10 per cent of his estimated surplus, and must sell an additional 30 per cent to the Government. The tax in kind is estimated by Government inspectors, who visit the landholdings in advance of harvest, on the basis of the assessment of 1304-1313 (1925-1934). The law provides that the additional 30 per cent of the marketable surplus, mentioned above, be sold to the Government at a "fair" price, the final price being subject to arbitration by a commission composed of three Government representatives and two local persons. The peasants' share of the grain is exempt from both taxation and forced sale.

Landowners, and farmers with small surpluses, deliver grain to country storage centers established in the surplus-producing areas. The number of centers varies from 12 to 20, depending upon the season's requirements. Here the grain is stored in simple buildings, usually with provision for air circulation underneath the storage floor. Grain can be stored in the centers for a maximum of a year, and the spoilage rate is probably high. The wheat is subsequently transferred to the Government elevators.

The Government wheat is used for the production of so-called "Government bread", distribution of which is under the supervision of the Cereals and Bread Administration. The Administration has charge of converting the wheat into flour, most of it being milled by private millers at a contract price of Rls. 300 per ton. The Government bread is baked and sold by authorized bakers who are licensed by the Administration and receive their flour from it. There are Government bakers in about 300 towns and cities, and it is the policy of the Administration to establish at least two bakers in each principal neighborhood. An authorized baker of Government bread may also bake and sell free market bread, and frequently does. Government bread is available to anyone who wishes to purchase it, but its quality is far below that of the free market product.

The Cereals and Bread Administration sells flour to authorized bakers, and the baker sells bread to the public at Rls. 3.25 per kilogram. The present price of free market bread is Rls. 7 per kilogram. Distribution of free market wheat to bakers is approximately 200,000 tons annually, while about another 300,000 to 400,000 tons move into the free market.

Free market wheat and bread moves into consumption by very different means. The landowner provides his own storage, either near the point of production or near the public market. He frequently holds back enough wheat to protect his peasants against the danger of shortage, and marks the rest for sale. Naturally he tries to secure the highest possible price, and in times of shortage tends to hold back his supply of grain until peak prices can be secured. Landowners normally dispose of their grain holdings at one of three times: at harvest time when their cash requirements are high, in the late winter or early spring when the price tends to be highest, and at spring planting when cash is needed.

Free market grain is generally sold at public markets or auctions, called "allaf-khaneh", located in towns near the producing areas. A good deal of wheat is stored near the market place and is disposed of through wheat brokers, called allafs. These usually work on a commission of about four per cent. Large landowners may have their own sales representatives. Allafs also buy in their own names, usually at harvest time when prices are low, and may hold the wheat for a speculative profit.

In addition to these major channels of distribution, there also are grain merchants who buy direct from the landowners; free bakers, who purchase grain from nearby villages, landowners, in the market place, or from grain merchants; and millers who purchase in a similar manner. Both bakers and millers warehouse wheat.

The price of wheat varies materially during the year. The harvest time price in 1327 was Rls. 5,000 per ton, rising later to a peak of Rls. 8,500, and dropping to Rls. 7,000 early in 1328. During this period the official Government price varied from Rls. 2,800 to Rls. 3,500. It will be noted that the disparity between Government and free market prices on both wheat and flour is always great, as indicated in the following table, which shows average wholesale prices of wheat and flour during different seasons in the Tehran market:

Year	Price, In Rials, Per 100 Kilograms			
	Government Wheat	Free Market Wheat	Government Flour	Free Market Flour
1324				
Spring	270.0	411.6	313.4	494.6
Summer	268.9	327.3	313.4	375.9
Autumn	270.0	370.0	313.5	435.0
Winter	270.0	370.3	313.5	459.5
1325				
Spring	270.0	385.0	313.4	392.3
Summer	270.0	365.7	313.5	422.0
Autumn	270.0	366.3	313.3	433.3
Winter	—	411.1	—	455.6
1326				
Spring	280.0	441.7	235.0	494.4
Summer	280.0	397.1	235.0	463.9
Autumn	280.0	425.0	235.0	483.3
Winter	280.0	511.1	—	527.8
1327				
Spring	260.0	655.4	443.3	743.3
Summer	270.0	544.4	333.3	641.7
Autumn	270.0	750.0	300.0	908.3

Analysis of the Program

Inasmuch as the Government's objectives of assuring an adequate supply of grain between crop seasons and of assuring bread to city dwellers at prices they can afford are economic and political necessities, the question arises whether, in the long run, the present program constitutes the most efficient means for achieving these purposes. An analysis of the effects of the program, therefore, is desirable.

It is claimed that Government purchase of grain at less than the free market price has discouraged production. Reliable statistics regarding grain production over a long period are not available; reasonably authoritative estimates for recent years, however, indicate only a moderate decline:

Year	Hectares Seeded	Metric Tons Harvested
1325	2,400,000	2,215,000
1326	2,400,000	2,175,000
1327	2,200,000	2,170,000

Since the success of the Government program depends largely upon the amount of grain collected, evidence on this point is especially important. The following data, showing Government wheat collections, distribution to bakers, and stocks of wheat in warehouses for the periods 1317-19 and 1322-26, indicate the situation in this respect:

	In Metric Tons	
Year	Collections	In Warehouses End of Crop Year
1317	343,300	85,200
1318	208,100	167,800
1319	204,200	101,100
1322	112,300	50,800
1323	184,200	100,200
1324	92,000	83,000
1325	134,000	86,400
1326	127,400	18,200
1327	—	60,000 (Estimated)

It is evident that Government collections prior to 1320, when there was no differential between Government and open market prices, were considerably above those since that date. It is equally clear that the carry-over available to meet emergencies and for price equalization purposes is materially smaller today than prior to 1320.

The testimony of informed observers leads us to the conclusion that the present wheat and bread program stimulates undesirable practices on the part of both growers and bakers. It is reported that growers seek to have their quotas for delivery to the Government set as low as possible; and it is clear that the present method of assigning quotas and collecting grain could easily lead to dishonesty. Hiding surplus stocks and adulteration of grain delivered to Government centers is reported. It seems generally accepted that a substantial volume of grain is smuggled into neighboring countries where the price is more attractive; informed observers estimate that as much as 50,000 tons annually may be lost to Iran in this manner. There seems to be a tendency on the part of Government bakers to practice adulteration in the baking of Government bread and, especially in times of shortage, to divert Government flour into the free market. This is made all the easier by the fact that many bakers produce both Government and free market bread.

The most important test of the present program is its ability to meet an emergency arising out of crop shortages. In this connection, the experience of 1327 is instructive. Grain supplies were short in 1326 and Government stocks were depleted by the liberal distribution policy followed at that time. When the seriousness of the situation was realized, strenuous attempts were made to accumulate surpluses from the 1327 crop. A decree of that year required landowners to deliver all surplus grain over three tons to

the agents of the Cereals and Bread Administration, arrest and other penalties being prescribed in event of non-compliance. Government grain prices were raised, attempts were made to reduce smuggling, and an embargo was placed upon the movement of grain from certain areas. As a result, free market prices rose appreciably, Government bread supplies frequently did not keep pace with demand, and riots are reported in some areas. Application was made to the International Emergency Food Commission and to the United States Government for assistance in coping with the emergency. While some of the difficulties undoubtedly arose from the misapplication of a fundamental policy, such as the liberal distribution during 1326 in spite of low stocks, the experience of 1327 raises a question as to the ability of the policy to effect its stated purpose.

The cost of the program to the Government also merits analysis. In 1325 and 1326, for example, the Government paid landowners over Rls. 1,000,000,000 for more than 300,000 metric tons of wheat and barley. Had this grain been bought at the free market rate, it would have cost almost twice as much. The landowners therefore may be said to have subsidized the Government bread program to an amount approximately equal to that paid by the Government, assuming the open market price would have remained the same if all grain had moved freely. During these two years, collection, transportation, storage, and distribution costs amounted to approximately Rls. 600,000,000, bringing the total cost of the program during the period to about Rls. 1,600,000,000. Receipts from distribution, however, were only in the neighborhood of Rls. 1,300,000,000, thus leaving a deficit of Rls. 300,000,000.

Evaluation

It is evident from the data available that the present Government grain marketing policy suffers from a number of weaknesses. There can be little doubt that the payment of less than the free market price to landowners discourages production, and encourages many undesirable practices.

There is reason to believe that the present purchase policy accentuates price fluctuations and market shortages in poor crop years. Government purchases amount to between one-third and two-fifths of the marketable supply, and reduce free market stocks by a corresponding amount. It is axiomatic that the smaller the supply in relation to total demand, the greater will be the fluctuations in price. Extreme price fluctuations, which seem to be the rule in Iran, encourage speculation and thus may stimulate hoarding.

It also is questionable whether the present grain distribution policy can be expected to work effectively in times of emergency. In time of crop shortage, the percentage of total supplies collected by the Government, assuming its program is successful, will increase, because it will buy more than the 30 per cent of surplus above referred to. This means that, while Government supplies conceivably could be about as large as usual, the free market supply of grain might be much smaller than usual. Were this to happen, the free market price would be certain to rise substantially, and with it the price of free market bread. Fewer people would be able to afford free market bread, and therefore more would seek to purchase Government bread. The Government's program has never envisioned supplying bread to all of the urban population, but only to those of limited means. Therefore, the Government bread supplies would be inadequate to meet the new demand. Inability of the Government to meet its implied commitments would probably result in further speculative price rises in free market grain and bread, and certainly would adversely affect public morale.

Possible Solutions

The wheat and bread distribution policy is so complex and important that a complete and exhaustive analysis, leading to the development of a comprehensive program for improving distribution cannot be made quickly. The development of such a program in keeping with increased production should be a major concern of the Plan Organization, working in co-operation with the other appropriate Government agencies. The general lines of approach, however, are quite clear. It is vitally important to increase the production of essential grains and the carry-over stocks as rapidly as may be practicable, both as an immediate precaution and as a basis upon which an improved distribution system can be established. We believe that annual carry-over stocks should approximate the full capacity of the Government elevators or 170,000 tons. The existing Government elevators should be equipped for complete operation as soon as possible. With this should go development of cleaning facilities and improvement of storage facilities in the centers of original concentration.

The ultimate goal should be to build up a sufficiently large and mobile reserve stock of grain to enable the Government to meet all probable emergencies without further recourse to forced collection. Grain should be purchased at open market rate, and the Government reserve should be used as a device for stabilizing prices by buying heavily when crops are good and prices tend to fall, and by selling during short crop years when prices tend to mount. This might dispense with the necessity of providing a special Government bread at subsidized prices.

KEROSENE AND OTHER PETROLEUM PRODUCTS

Petroleum is Iran's most important developed natural resource, and petroleum products are vitally important to its economic future. Kerosene, for example, seems to offer the best prospect for a cheap fuel to replace the charcoal and grasses whose use today seriously threatens the nation's forests and plant cover and, therefore, its future water supply. Gasoline will become increasingly important as highways are improved and traffic encouraged. Gas oil and fuel oil are important sources of power. Cheap and efficient distribution of petroleum products, therefore, is an essential element in the development of the national economy.

Consumption of petroleum products has been increasing markedly in recent years as evidenced by the following table:

In Thousands of Liters

Year	Total Sales of Petroleum Products			
	Gasoline	Kerosene	Gas Oil	Fuel Oil
1325	140,048	137,737	31,849	260,567
1326	164,223	162,872	45,821	327,772
1327	178,112	204,040	57,593	420,963

The use of oil-burning appliances is increasing in the towns and cities. It is reported that 50,000 cheap kerosene stoves were imported into Iran during the past year, principally from Italy and the United States. Inasmuch as cost of transportation on these stoves represents between 50 and 80 per cent of the cif value, and as little specialized machinery is required for their manufacture, it may be desirable to consider fabricating such equipment in Iran.

Kerosene Distribution

The pattern of distribution for kerosene and gasoline in Iran is generally similar, so that kerosene may be used as an example. Under the concession agreement with the Anglo-Iranian Oil Company (AIOC), the base price of products for consumption within Iran is determined by the price of crude oil at the Gulf of Mexico or in Roumania, whichever is lower. Disrupted international affairs and world market conditions have impaired the applicability of the base, and discussions are under way for its modification. At present the AIOC is selling at the 1324 price pending the conclusion of negotiations.

Distribution throughout Iran is performed by the AIOC on a cost basis. It is specified that no profits shall be made from domestic distribution, and costs and payments therefore are readjusted at the year-end. A uniform price for kerosene and gasoline is charged throughout the country on the equalization principle. The channels of distribution employed are those normally used throughout the world—company offices with bulk tank station facilities, agents with secondary storage facilities, and franchise dealers. It seems to be the AIOC opinion that more widespread distribution can best be accomplished through the extension of the franchise dealer system. This conclusion seems logical. Examination of the present distribution system leads to the conclusion that, in view of the scattered nature of local markets and the extreme difficulty of transportation and storage, a good job has been done to date.

Distribution of kerosene and other petroleum products takes place in two principal ways: bulk distribution and package distribution. In the case of bulk distribution, kerosene moves in tank cars or trucks from refineries to bulk tank stations, from which it is distributed by truck to the surrounding territory or to secondary storage points. Package distribution, moving from refinery to ultimate point of retail distribution in 18 or 20 liter tins, is confined to Azarbaijan, eastern Khorassan, Kerman, and Baluchistan. Difficulties of transportation are responsible for the use of package distribution in these areas.

Using the Tehran area as an example, bulk distribution moves in the following manner. Approximately 90 per cent of the supply comes into the area by rail to bulk tank stations, the remainder moving there in tank trucks. The bulk station distributes to agents and dealers, principally by tank trucks. There are ten filling stations in Tehran, which also sell kerosene, and about fifty other retailers located throughout the city. Storage in the smaller retail outlets is in large drums. Under the bulk distribution system, the customer brings his own tin to the retail outlet and has it filled. There seems to be an active second-hand market for tins, and lorries of them have been seen moving into the Tehran area from the package distribution areas in the northwest.

Company agencies and franchise dealers serve the smaller towns and cities. Distribution to the villages takes place by independent dealers who buy either from the agent or the franchise dealer. At this point the company's control over price and outlets ceases. Kerosene moves to the agents and dealers by tank truck, and into the villages by whatever kind of container the independent dealer may possess. The company's agent and dealer system thus seems to cover most of the important communities, but does not reach villages unless they are centers of trade and are situated at important points along the highways. The present distribution organization of the AIOC includes 64 of its own branches, 45 agencies, and 55 franchise dealers.

We are informed that distribution facilities in the smaller communities are sometimes inadequate and that, during the winter, the price of kerosene in the villages may rise to many times the official price. In view of the limited market, larger distribution facilities could be maintained in the smaller communities only at a greater overall distribution expense. The village situation merely reflects the scarcity economics resulting from poor transportation and little purchasing power.

Package distribution must be discussed in terms of the problems of the particular areas to which it applies. Azarbaijan secures a major portion of its kerosene from the Kermanshah refinery, although the Tehran bulk facilities constitute a standby storage because of Kermanshah's limited productive capacity. Kerosene is packed in 18-liter tins at the refinery and then moved into the Azarbaijan area by motor lorry. Bulk tank trucks cannot be used because of the bad condition of the roads, a condition which applies to the distribution of all petroleum products in the area. Transportation is carried out by private truckers on a contract basis at rates varying between Rls. 0.2 to Rls. 2.0 per ton per kilometer, depending upon road conditions and the season of the year.

The problem in the south and southeast centers about the port facilities of Bandar Abbass and the road facilities to Kerman. Lighterage is necessary at Bandar Abbass and petroleum products are moved inshore in 18- and 20-liter tins in small boats, but the port is unusable for three to four months each year, due to weather conditions.

While the problems of package distribution are the most immediately pressing, there also are pressing problems with respect to the bulk distribution of kerosene to the north. The current deterioration of rail service and materially increased demand have placed a strain on transport which can easily result in shortages during the coming winter unless steps are taken to improve transportation as elsewhere recommended and to increase reserve supplies in advance.

Distribution Costs

We were furnished by the Ministry of Finance certain data on distribution cost of kerosene. These data reveal that, for the packaged product, transportation costs amounted to Rls. 1.3932 per liter, equivalent to 42.1 per cent of the retail price of Rls. 3.311, and that taxes amounted to Rls. .7750, equivalent to 23.4 per cent of the retail price. Similarly, for kerosene distributed in bulk, transportation costs were Rls. .7865 per liter, equivalent to 43.1 per cent of the retail price of Rls. 1.825, and taxes were Rls. .7750 per liter, equivalent to 42.5 per cent of the retail price. Thus, transportation costs and taxes account for approximately 65 per cent of the retail price of kerosene when distributed in packages and 85 per cent when distributed in bulk.

Two facts stand out as significant: the materially higher packaging and transportation cost involved in package distribution, and the large portion of the final retail price represented by transportation and taxes with regard to both forms of distribution. If the cost of tins is included, the transportation cost of package distribution is more than two and one-half times greater than for bulk distribution. Transport charges, packages, and taxes, combined, account for 83.4 per cent of the retail package price and 85.6 per cent of the retail bulk price.

A similar situation pertains to gasoline or motor spirit. Here transport and packaging represent 38.2 per cent of the retail price of the packaged product, while taxes account for another 39.2 per cent. In the case of bulk distribution of the product, transport charges amount to 20.4 per cent and taxes to 56.4 per cent. Taxes are materially lower on gas oil and fuel oil, but transport costs are proportionately high. It is obvious that taxes and cost of transportation comprise the two principal cost elements in both kerosene and gasoline today, and that the use of package distribution constitutes a heavy economic charge.

Any plan which may be undertaken for effecting cheaper and more efficient distribution of kerosene and other petroleum products must be based upon both near- and long-term prospects. Even with regard to the immediate program, some elements remain speculative, and constant study and experimentation will be required during the first years of the Seven Year Plan.

The most pressing present need is to reduce the amount of package distribution as rapidly as possible. Elimination of package distribution would reduce the price of kerosene in the package areas by more than 40 per cent. It will be possible to do this in most of Azarbaijan and the north by improvement of the Kermanshah-Sanandaj-Miandoab-Tabriz road so that it can be used by tank trucks. In the Kerman-Baluchistan area, the installation of bulk facilities at Bandar Abbass combined with development of facilities for the transfer of petroleum products from ship-to-shore and the improvement of the road to Kerman can assist materially in overcoming present problems. Both projects should be undertaken as soon as practicable.

In view of the critical importance of promoting the use of kerosene as a substitute for charcoal, we question whether the present high tax on kerosene is in the national interest. Elimination of the tax would reduce the present price of bulk kerosene by over 40 per cent; while elimination of both package distribution and the tax would reduce the retail price in present package areas by approximately two-thirds. Inasmuch as the kerosene tax is estimated to produce no more than Rls. 100,000,000, or 1.5 per cent of the total national revenues, complete removal of, or at least substantial reduction in, the tax should be considered most seriously.

As far as towns and cities are involved, a materially lower price of kerosene should rapidly affect the volume of consumption, but the full effect of lowered prices cannot be felt until cheap kerosene stoves and other appliances also are made available, and efforts should be made to furnish them. A possibility which seems to merit immediate investigation is to require public baths, bakeries, brick kilns, and other institutions which at present are heavy users of charcoal to change to kerosene or some other appropriate petroleum fuel after a certain prescribed date. Such action would have to be carefully timed; it would be useless to promulgate it until adequate equipment is available to the institutions affected and an adequate supply of fuel is at hand.

Extension of the use of kerosene in the villages is more complicated. This involves two major problems, namely, development of a cheap stove which can simulate the "flash-fire" qualities of the brush and charcoal to which the villagers are accustomed for cooking and baking, and provision of adequate transportation and storage at reasonable cost. The average villager has little money to spend. It might be necessary to subsidize him by selling the stove at less than cost. And there would remain the problem of persuading villag-

ers, who are basically conservative, that the new equipment and fuel are superior to those which have been employed for generations. This would require a carefully planned public relations and promotional campaign.

Provision of transportation and storage would be difficult and expensive. Capital would have to be provided for storage facilities, and for financing winter stocks. A considerably more extensive dealer organization would be required and close supervision would be necessary to prevent the charging of exorbitant prices during the winter months.

As in the case of sugar and tobacco, plans for extension of the use of petroleum products in villages might well be tested in a selected area. A number of typical villages could be chosen and an experimental program carried out under carefully controlled conditions. These experiments could be used to test techniques and establish a basis for the calculation of costs.

Possible Solution

The planning of a short-run program and the conducting of "test-market" experiments is a proper activity for the Plan Organization and for the new Iranian Petroleum Company to be organized as part of the Seven Year Plan. It is understood that there will be a foreign technical expert in the distribution of petroleum products among the first group of such experts to be retained by the oil company. It is suggested that this expert be attached to the appropriate division of the Plan Organization to work out the following: (1) the details of the proposed shift from package to bulk distribution in the areas involved; (2) development of a program for the rapid increase of kerosene distribution and use in towns and cities; and (3) development of an experimental "test market" program for the extension of the use of kerosene in the villages.

It is suggested that this be made a Plan Organization project, but that at the appropriate time the AIOC also be brought into the discussions and be given opportunity to comment upon such tentative plans as may have been developed and to assist in the development of a final program.

If all goes well, the program just discussed should be required for no more than four to six years. The final distribution program may well depend primarily upon the development of new sources of fuel. There is a possibility of coal near Kerman. If this coal should prove to be of a quality suitable for domestic consumption at a reasonable price, it might assist materially in relieving the situation in that area. It is hoped, also, that oil will be found in new areas strategically located with respect to important domestic consuming markets. These possibilities, however, need not interfere with the formulation of plans based on the existing situation.

CO-OPERATIVES

There has been a great amount of discussion of co-operatives in Iran and high hopes are placed in them. Development to date has been comparatively limited: there are now 15 consumer co-operatives of various types and 10 agricultural co-operatives. Most consumer co-operatives have been formed either by companies or Government agencies.

Co-operative enterprise is well suited for a number of important agricultural undertakings, such as rental of land and water, administration of water supplies, purchase or

rental of farm equipment, purchase of seeds and other supplies, joint efforts with regard to harvesting, storage, grading and processing, packing, packaging, transportation, and marketing of products. Financing of purchases made for personal needs, together with the actual buying of such supplies in quantity, can also be effected through various forms of co-operatives.

The principal usefulness of co-operatives in urban centers is for the purchase of essential goods, although they also have significant possibilities with regard to the encouragement of savings and for the improvement of artisan and handicraft industries.

Certain principles govern the formation and maintenance of all sound co-operative ventures. Co-operatives must result from voluntary effort and must be democratically managed or the likelihood of failure will be great. Each member should have no more than one vote. A minimum investment should be required of each member, the amount being determined by the needs of the co-operative and the abilities of members to supply capital. Goods generally should be sold by the co-operative, preferably although not necessarily for cash, at or near current prices. After allowing for a low rate of interest on invested capital, usually 6 per cent, and setting aside adequate reserves, any profits accruing to the co-operative should be distributed in the form of patronage dividends; that is on the basis of the amount of goods purchased by each individual member during a specified period. While these are the ultimate operating principles, they can be modified in many particulars to meet local needs; and indeed the variety of co-operatives seems to be increasing.

In addition to being voluntary, co-operatives also must be established upon a solid foundation. There must be a habit of working together and a feeling of group solidarity as may be found, for example, in villages or factories. The requisite leadership must be present. Finally, the co-operative must be truly a joint undertaking in which responsibilities and privileges are mutually shared. They must not be allowed to degenerate into a paternalistic venture if they are to succeed over a period of time.

The growth of co-operatives cannot be accomplished by passage of legislation or by compulsory formation. Such a policy would be self-defeating. Rather, co-operatives must be encouraged to grow slowly and naturally, special attention being paid to the creation of a sound foundation for future development. Government can be most helpful in this respect. It can provide the initial financing and skilled guidance and supervision. It also can assist by favorable legislation as to taxation and similar matters. This legislation, however, should not be carried to the point where it discriminates unfairly against other forms of private enterprise. Government can promote experiments designed to determine the forms of co-operatives best suited to national needs and to the requirements of particular groups; and it can stimulate the widespread establishment of such co-operatives once the experiments have yielded satisfactory results. Beyond this, it seems unwise for Government to proceed.

A number of forms of co-operatives seem to hold promise of usefulness in Iran. The establishment of specific types of co-operatives in connection with some of the experimental programs has been recommended in the agricultural section (Vol. III). Most of these center about the rental of land and water; administration of the water supply; purchase of seeds, equipment, and livestock; joint efforts in storage, grading, processing, packing and packaging; and in marketing. The view as presented in the agricultural section is that emphasis originally should be placed upon the purchase and production aspects of co-operatives and that the marketing phases should be developed fully only after these

other activities are soundly established. Indeed, it seems certain that the soundest development of agricultural co-operatives can be effected through the experiment and extension program recommended in the agricultural section.

We have recommended the formation of co-operative stores in the villages whereby peasants can buy essential goods at reasonable prices and credit terms. This program entails the furnishing of store premises by landowners, together with their keeping the necessary records and assuming custody of the goods and funds. The peasants, in turn, would furnish the labor to run the store and would pledge their growing crops to secure any advances made by the store.

The various stores would be supplied by a company to be formed for that purpose. The company would be organized on a national basis for purchasing activities, but would perform its wholesaling operations in conjunction with ostan centers and on the basis of quantity, types and qualities of goods ordered by the various village stores.

The principal functions of the company would be as follows: to purchase goods at wholesale prices and to make them available to village stores at regular intervals, at which time collections would be made for goods sold since the last visit; to extend credit where necessary against the next year's crops, but at a low rate of interest; and to purchase from the villages goods which might be sold in other villages. It is contemplated that the formation of the company would be a Plan Organization function, and that the supervision of the village stores and ostan operations would be part of the agricultural extension program supplemented by additional staff and expert foreign assistance retained specifically for this purpose. The plan is soundly conceived and holds much promise. It possibly could be extended to include the village kerosene distribution program, once the details of this undertaking have been developed.

Several other forms of co-operatives seem suited for urban purposes: purchase-and-savings co-operatives, buying co-operatives, and craftsmen's co-operatives. A purchase-and-savings co-operative is one whereby a member is enabled to purchase some desired article, such as a sewing machine, with a small down payment and with subsequent payment of regular installments until the entire price of the article has been covered. The installments usually are deducted from the member's wages by his employer. Actually, the plan is a co-operative version of installment buying. In a nation such as Iran, it has the advantage of enabling workers and others to obtain useful durable goods and household improvements sooner than otherwise would be the case, and to pay for them by orderly saving. This form of co-operative has been successful in countries whose economy is not greatly different from that of Iran.

A buying co-operative is one which purchases generally needed merchandise, such as kerosene and cotton piece goods, at wholesale prices and makes these available to members on a cost-of-operation basis. Buying co-operatives usually begin with the distribution of essential goods, but may extend their activities as they grow in strength and membership. Both purchase-and-savings and buying co-operatives can best be organized in Government agencies or in factories and other similar private business enterprises. It is suggested that their possibilities be studied carefully and that experiments be conducted as to the best way of organizing, operating, and promoting them.

Essentially a craftsmen's co-operative is the counterpart of the producer's co-operative in the agricultural field. Its most probable possibilities are in fields such as woodworking and furniture making, rug weaving (as carried on in villages) and the skilled

crafts for which Iran is noted. Co-operatives in such fields might assist in the purchase of supplies and in the financing thereof; in providing advice and guidance as to the most effective use of materials, designs and similar matters; and eventually in marketing. It is difficult to estimate the degree to which craftsmen could be persuaded to attempt such joint efforts, but the field is one which should be examined carefully.

It is suggested that the work of establishing and developing co-operatives be placed in a separate division of the Plan Organization as provided for in the organization section of our report (Vol. V). This division should work closely with the agricultural division, as well as with the company and business division. The role of Government and of the Plan Organization should be that of research, promotion and financial assistance; all forms of paternalism or forced growth should be avoided.

In our opinion, there has been some over-optimism as to what could be accomplished in this field within a comparatively short time. There are few fields wherein the careful laying of groundwork and slow but steady building upon original modest accomplishments is more important than in the development of co-operatives. It is recommended, therefore, that all attempts at widespread establishment of co-operatives be delayed until sufficient experience has been secured from carefully controlled experiments to lay a sound groundwork for the general program.

EXPORT TRADE

Iran is the world's second largest exporter of petroleum products, but inasmuch as this trade does not enter directly into the distribution phase of Iranian economy, it needs no discussion in this section of the report.

With the exception of petroleum and rugs, all principal exports are composed of agricultural products. The tonnage and value of principal exports in recent years as reported by the Ministry of Finance were as follows:

	Average of 5 Prewar Years 1314 to 1318		1325		Postwar Years 1326		1327 (9 months)	
Commodity	Tons	Value	Tons	Value	Tons	Value	Tons	Value
				(Values in Millions of Rials)				
Rugs	3,394	116.6	3,667	614.9	2,689	429.2	3,219	441.2
Dried fruits and nuts	58,842	123.8	48,539	371.7	64,248	370.8	39,921	339.0
Gum tragacanth	3,183	43.7	2,864	158.8	3,258	168.8	2,998	98.0
Raw lamb skins	—	35.4	—	23.8	—	57.4	2,865	119.9
Other skins and hides	3,460	25.0	4,110	74.8	2,895	54.7		
Wool down, raw hair, etc.	8,773	66.2	2,918	66.3	2,756	89.1	456	10.3
Casings	464	33.3	198	14.6	261	16.7	340	14.3
Other exports	126,664	245.8	146,007	245.2	99,967	1,137.5	56,557	373.1
Total Exports	204,780	689.8	208,303	1,570.1	176,074	2,324.2	106,356	1,395.8

Note: increase in rial values of exports is due principally to price inflation.

The average tonnage of exports for the years 1315 to 1319 inclusive was 197,079 and for the years 1324, 1325, 1326, and the first nine months of 1327 the annual average was 162,085. Only in the year 1325 did the volume of exports exceed the prewar average. There also has been a marked change in the destination of exports. The short-lived German market which developed before the war in connection with large purchases by Iran of German machinery and equipment is no more. Trade with Russia has almost disappeared since 1326, because of failure to agree upon a satisfactory trade treaty. On the other hand,

the United States, Great Britain, India, and France have become increasingly important markets for Iranian goods and there is evidence that markets in Middle Eastern countries also have been expanded.

Rugs

The rug market has been declining in recent months. High cost of production has been a contributing factor to this decline, but in addition heavy exports in recent years have tended to glut the market in many parts of the world so that overseas prices of Persian rugs are sometimes less than in Iran. Tariff and import restrictions applied to luxury products by some western European nations also have been an impediment to sales.

At the present time the United States is the principal market for Persian rugs. In 1326 it purchased directly rugs to the value of Rls. 141,700,000, about one-third of the total 1326 rug exports. Great Britain is second in importance, France third, and India fourth. Direct purchases by Britain in 1326 were in the neighborhood of Rls. 42,000,000; French imports were about Rls. 24,500,000, and Indian imports Rls. 21,300,000. The latter compares with a volume of Rls. 93,800,000 in 1324. In 1326 exports of Persian rugs to Iraq, Lebanon, Syria and Turkey totaled nearly Rls. 100,000,000 or slightly less than one-fourth of total exports. These countries are largely re-export centers and it is probable that indirect purchases by the United States and European countries were substantially greater than those shown above.

Agricultural Products

The situation with respect to exports of dried fruits and nuts is fraught with special difficulties. The closing of northern outlets for the products of Azarbaijan and the Caspian area has required these regions to ship their products through the southern ports. This has not only added substantially to costs but has caused delay in reaching the market so that instead of having a non-competitive market close at hand the products must compete with those of other nations which have probably reached the market first. Such production as is not sold at the season's end is carried over to the next season when it has become less desirable and commands a lower price.

An important obstacle to successful merchandising of these products is the lack of grading, standardization, disinfection and packing. These shortcomings combined with certain undesirable trade practices, if uncorrected, will work to the detriment of the Iranian export trade. Under the bilateral agreement, which was in force prior to the war, Germany was willing to accept a lower quality of product than will be accepted by most nations today. Sanitary standards are being raised all over the world and unless Iranian exports can meet them they will face increasing difficulties. There is as yet no adequate fumigating plant in operation in Iran, though we understand one is being planned at Khorram-shahr.

Various attempts have been made to bring together growers of various products, for example, pistachio nuts, in voluntary programs for grading and standardization, but to date none of these has been successful. Without such quality control buyers will be uncertain as to the standard of goods they are purchasing.

The effects of these shortcomings have become apparent. The admittedly superior Iranian dates are at a competitive disadvantage with the better packed and marketed Iraqi products. An increasing number of overseas purchasers are sending representatives to Iran to superintend grading and packing, and many foreign importers are showing

reluctance to handle Iranian products. The ill effects of this situation are intensified by the frequent failure on the part of Iranian producers to meet specifications and delivery dates. As an example, an order for 7,000 tons of dried raisins was received from a certain government in 1327. At the time of our study only about one-tenth of this order had been shipped and some of it had failed to meet specifications.

The lack of proper standardization and processing applies to other products. In wool, for example, sheared and limed wool are frequently mixed, giving rise to almost impossible dying problems. Kidskins frequently are sun dried without washing or stretching with the result that they often crack and sometimes develop worms before delivery to customers. Indian kidskins, which are properly graded and processed, have been faring much better in world markets than Iranian skins.

A program designed to develop proper standards and to insure their widespread application is thus a pressing necessity for the development of export trade.

Analysis of the Export Problem

During the past several years Iranian exports have been tending to decline both in volume and in value. While the relatively low purchasing power of the rial in overseas trade, in relation to domestic price levels, may be partly responsible for the situation, the basic causes lie deeper.

Iran is faced with a basic reorientation of its export trade markets as a result of the recent world war and present unsettled international conditions. It seems certain that the United States, Britain and western Europe, India, and possibly some of the nearby nations of the Middle East will be the most important markets. Markets, however, must be determined in terms of specific export commodities and much additional detailed study is required on this point.

Two of Iran's principal exports, rugs and dried fruits and nuts, face special problems. Rugs are faced with a declining market resulting from increased production costs, growing competition from machine-produced rugs, and shifting fashions in the American market. It may be necessary to change the entire emphasis of the rug export business to relatively non-competitive high quality, luxury products if the dollar volume of exports is to be maintained at acceptable levels. Similar steps will have to be taken to preserve other overseas markets; but since the style and type preferences of various markets differ widely, each market will have to be studied separately and plans made accordingly.

Two problems are involved in the exportation of dried fruits and nuts: (1) adequate transportation and outlets into world markets for the products of the north; and (2) adequate grading, standardization, sanitation and packing to ensure acceptance in the world market. The latter problem, moreover, applies to practically all agricultural commodities moving into world trade.

The long-run solution of expanding Iran's export trade will necessitate careful study of trade trends, present and potential markets, improved marketing methods, and the possibilities of new markets and new export commodities. Such study should be an important activity of the Plan Organization.

Anything which can be done to increase the speed and efficiency with which goods can be moved to ports of exit and to increase the efficiency of these ports will be of material

assistance to export trade. Study should be devoted to merchandising plans, particularly for rugs and dried fruits and nuts.

With regard to dried fruits and nuts, we recommend that efforts be made to develop a more direct way to the Mediterranean than is now available through southern Iranian ports. Two possibilities exist in this respect for northern products—transit through Turkey to a Black Sea port, or transit through Iraq and either Syria or Lebanon to a Mediterranean port. It is recommended that appropriate action be taken to determine the willingness of the foreign governments concerned to grant Iranian products transit privileges; and that careful study be made to determine which routes and ports would be most advantageous.

With respect to the grading, standardization, sanitation, packing and certification of raw commodities moving into export trade, we suggest that as soon as possible a comprehensive program be developed, designed to cover all major export commodities. Such a program would require the use of foreign experts working possibly for one or two years. These men could also be used to set standards for domestic crops such as wheat, cotton, milk and milk products.

The specific tasks of the experts, working with the Plan Organization, should be (1) to determine suitable standards for each commodity; (2) to set up practical means of grading, cleaning, packing, and certification; (3) to determine the best methods by which such enterprises might be organized with the assistance and stimulation of the Plan Organization; (4) to help to initiate such programs; and (5) to train Iranian personnel to take over operation and further promotion of the programs.

The experts should be advisers to the Plan Organization and should work closely with both the proper agricultural authorities and with those charged with export trade development. It is possible that as many as six to eight experts may be required and that the annual cost, excluding maintenance, would be between Rls. 1,560,000 and Rls. 2,080,000 per annum. Maintenance should cost between Rls. 780,000 and Rls. 1,000,000 per annum.

As far as possible, these programs should be voluntary. If leading producers can be persuaded to embark upon them, and if their efforts have favorable results it will be comparatively easy to persuade other producers to follow. It would be preferable for such programs to be privately operated and financed, although in the preliminary stages financial assistance from the Plan Organization may be necessary or advisable. Programs could be organized through chambers of commerce, specially formed associations, or by means of private companies which would standardize and grade for a moderate fee. If satisfactory private means cannot be devised, the program should be made a function of the Plan Organization and the other appropriate agencies of Government.

Steps should be taken to exploit new markets. The bilateral agreements with western Germany and France, both in process of negotiation, are to be commended as temporary measures to increase export trade. It should be noted, however, that bilateral agreements are not a permanent cure for export and import trade ills. Expanding multilateral trade is the healthiest development in the long run.

In addition to the study of product and market potentials discussed above, careful study also should be made of current export duties and regulations to determine the extent to which they help or hinder export trade. Following study and analysis a factual report,

including broad recommendations, should be submitted to the appropriate agencies of Government.

Finally, a bureau for the promotion of overseas trade should be organized as part of the Plan Organization to conduct the various studies recommended above, to assist in implementing various aspects of the program, and to assist private entrepreneurs engaged in export trade to conduct their activities more efficiently and profitably.

SUMMARY AND RECOMMENDATIONS

It is evident that Iran must begin the improvement of its distribution system from the very foundations. Increased production and availability of essential consumers' goods, combined with much more widespread distribution of purchasing power, are the prime prerequisites. Improved transportation is almost equally important. Without substantial improvement in these two fields, little can be accomplished in modernizing the nation's distribution system.

Needed also are better storage, more processing facilities for raw commodities, the general application of grading, standardization and sanitation, better packing and packaging, improved communications, better credit facilities, more and better market information and statistics, more widespread dissemination of such information, and a much greater knowledge and practice of sound distribution policies and methods. These needs apply equally to private and Government enterprises.

Because of the difficulties created by Iran's terrain and the location of its principal market areas, a policy of balanced regional development and dispersion of productive facilities should be favored as far as this is feasible, in order to hold in check the cost of transportation resulting from this natural handicap.

While Iran may have too many speculators, there is a deficiency of middlemen performing the wholesale function, and intermediary trade as a whole is too highly concentrated in Tehran. The development of more wholesalers and the dispersion of wholesale trade should be encouraged. The usefulness of co-operatives and other marketing institutions should be studied carefully. The proposal for a model dairy and milk processing plant for the Tehran area, either on a co-operative basis or by means of some other form of private enterprise, should be given the most serious consideration. A fresh fruit and vegetable market in Tehran, operating under free competitive conditions, also should be considered.

As indicated elsewhere in this report, grading, standardization and sanitation, together with better packing and packaging, should be widely applied both to export commodities and those moving in domestic distribution.

Work should be planned and undertaken as soon as practicable in the collection of the following types of marketing information:

1. Basic market data as to population, including number of families, age, sex, education and occupation; wages and income; and consumption habits.
2. Data as to production, number of enterprises, employment, stocks on hand and changes in supply, price movements, sales volume, and distribution costs for agriculture, industry and trade. Crop and production estimates, information as to supply conditions and wholesale and retail price changes should be collected at frequent intervals.

3. Basic data as to the channels of distribution used and prevailing trade practices employed in the distribution of principal goods, inasmuch as there is little or no organized information existing in this field today.

As such information becomes available, it should be widely disseminated by the Plan Organization and other appropriate Government agencies by means of the press and radio, bulletins and other printed material, and through conferences and meetings. An efficient broadcasting system, covering the entire nation, can be highly useful in the dissemination of day-to-day market information, and the new facilities recommended in the communications section (Vol. IV) should be used for this purpose. It also may be worth while to consider the advisability of limited radio advertising as an aid to the dissemination of price information and a stimulus to competition, while also producing some revenues for the broadcasting system.

Working with the other appropriate agencies of Government, the Plan Organization should take the leadership in the improvement of distribution practices and facilities, including the completion of Government grain storage facilities and the development of improved distribution programs for Government monopolies and factories, for wheat, petroleum products and export trade, as suggested earlier in this report.

Studies also should be made as to the effect of present Government regulations regarding both domestic and export trade upon the development of a sound distribution system, as well as the effect of current indirect taxes upon distribution of essential commodities. Findings of fact, together with broad recommendations, should be prepared by the Plan Organization for submission to the appropriate agencies of Government.

The development of an improved distribution system should be encouraged as far as possible by means of private enterprise and with special emphasis upon the development of healthy competition. The Plan Organization should stand ready to provide guidance and assistance to private business in this respect.

IMPLEMENTING THE PROGRAM

Inasmuch as distribution relates equally to all phases of the economy, it is properly a function of the central Plan Organization. It is recommended, therefore, that a marketing and distribution division be established to carry out the distribution program. The functions of this division would be as follows:

1. To plan and implement programs for the improvement of domestic and overseas distribution.
2. To conduct basic studies as to markets, marketing methods, current distribution channels and methods, the effect of Government policies upon distribution, and similar matters.
3. To assist Government monopolies, companies and agencies, as well as private enterprise, with regard to distribution problems; working with other appropriate Plan Organization divisions and Government agencies.
4. To advise the Plan Organization and appropriate Government agencies regarding distribution programs and policies.

It is probable that the division would function most effectively if divided into three sections; a small statistical and research group to work closely with the Plan Organiza-

tion's central statistical bureau and with the other sections of the marketing and distribution division; a domestic distribution development section, and an overseas trade promotion division. Close liaison also would be maintained with the agriculture and industry divisions.

The following foreign advisers would be required for the distribution program:

1. A general distribution adviser to assist the director of the division and to co-ordinate the work of the other foreign distribution advisers, as well as to help in training Iranian staff, probably for at least a three-year period.
2. A market research expert to assist in setting up the market and marketing research section and to train Iranian staff, probably for a three-year period.
3. A foreign trade expert to assist in the development of the overseas trade development section, probably for at least two years.
4. A team of standardization experts, as outlined earlier in the report, to assist in the development of the grading, standardization, sanitation and certification program, and working closely with the Agricultural Research and Extension Institute, probably for at least two years.
5. A wheat marketing expert to aid in developing an improved system of grain and bread marketing, probably for at least one year.

The following sums would be necessary for foreign staff:

	In Thousands of Rials		
Year	Domestic	Foreign Exchange	Total
1328	900	1,980	2,880
1329	1,700	3,800	5,500
Subsequent	1,200	2,535	3,735
Total	3,800	8,315	12,115

Inasmuch as the development of the distribution program depends so largely upon the progress made in other areas of the economy, it is not possible to detail a comprehensive year-to-year progra However, it seems advisable that the following projects at least should be initiated during the years 1328-1330:

1328

1. Organization of the marketing and distribution division.
2. Negotiations regarding transit privileges for Iranian exports as recommended.
3. Beginning of work on the kerosene and petroleum product distribution program.
4. Beginning of work on the rug export program, preferably confined to further survey and detailing of the program.
5. Beginning of studies and programs to improve the distribution efficiency of Government monopolies and factories.
6. Preliminary studies and experiments relating to co-operatives.
7. Initiation of the market and marketing research program, covering as as many of the recommended items as may be practicable.
8. Initiation of the study of the grain and bread distribution program.

9. Exploration of the possibility of further trade agreements with foreign nations.
10. Determination of what can be done to capitalize upon the export possibilities inherent in the salt mines.

1329

1. Continue with the programs initiated in 1328.
2. Initiate the grading, standardization, sanitation and certification program.
3. Begin the establishment of comprehensive advisory services for private business.
4. Begin the comprehensive program for the dissemination of essential trade information.
5. Complete basic distribution studies.

1330

1. Expand the standardization and grading program.
2. Complete the work on the short term kerosene distribution program.
3. Develop the program of the marketing and distribution division to the point of full-scale operation.

LEGAL MATTERS

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LEGAL MATTERS

The Seven Year Plan touches practically every phase of Iranian life and of the country's economy. It cannot be carried out effectively without a substantial revision of many of the laws on the statute books today. Much of this legislation should be enacted as the Plan progresses and as experience discloses both the practical needs and the wise course of action.

But law-making takes time. It is therefore well to prepare now for the enactment of certain types of legislation which are certain to be needed as the Plan is carried into execution.

Accordingly, in the succeeding paragraphs of this section, we submit certain recommendations respecting those phases of law which bear generally upon the power of the Government to carry out public works, to proceed with the general development program contemplated under the Plan, and to provide a sound legal basis for sharing the benefits, as well as the financial burdens, of the Plan.

ACQUISITION OF PRIVATE PROPERTY

The sacredness of the individual's right to his property is deeply imbedded in Moslem law. As a result, there has been resistance in Iran to laws which permit the State to take private property even for public purposes. Furthermore, the landed property owners have been largely in control of the Government and have protected their own positions, not only against the taking of their property by the State for public purposes but even against direct measures of taxation levied on property.

The Constitution of Iran declares the general principle that no one can be dispossessed of his property except for legal cause and then only against just compensation. "Legal cause" as used in this context does not mean, we understand, any reason which might be found convenient by a particular government, but requires a statute indicating the general purpose for which the private property is to be taken and specifying the means for payment.

The laws so far enacted in Iran under this Constitutional provision are quite inadequate to permit the Government to take over the land and other properties essential to the development of irrigation, transportation, power, social betterment, and other public projects. The only general laws of any importance in this field cover the rights granted to municipalities to take property within their limits for the purpose of constructing highways, squares, canals, etc., and a law covering the right of eminent domain for the construction of particular types of water systems, chiefly the kanats.

New legislation is urgently needed to give the Government broader powers of property acquisition, under proper safeguards of the rights of the individual. It was the unanimous judgment of Iranian legal authorities consulted that work on such a statute should be immediately undertaken so that a draft may be submitted to the Majless as soon as possible.

The fact that the right of the State to take property for public purposes is not clearly established by law has resulted in unhealthy land speculation in areas where public projects are already under way or where it is believed that projects are likely to be initiated under the Plan. This speculation has tended to delay important public projects due to the

inability to secure the needed land at a fair price. To put an end to such speculation, the compensation provisions of any expropriation law should fix the principle that the valuation placed on the land to be taken is the value of comparable land in the neighborhood not directly affected by the public improvements proposed, and without giving effect to the enhancement in value resulting from such public improvements.

We recommend that a study be made of the practical working of the Law of the 20th of Tir, 1320 for the building of thoroughfares and other public works in municipalities to determine what improvements should be introduced in existing procedure in order to insure fair compensation. Further, to avoid administrative delays, it is suggested that consideration be given to empowering the Plan Organization itself to exercise the right of expropriation with respect to those projects, within the scope of any general expropriation law, which are carried out by it under the Plan.

Incident to exercising the right of eminent domain for public improvement, particularly irrigation and power projects, substantial benefits would accrue to great numbers of people in the immediate vicinity of these public improvements. Unless some measures are found by way of taxation or contribution, these persons would be "unjustly enriched" at the cost of the State and the general taxpayer. Where the public improvement is of the nature of a controlled water supply system, it may be possible to charge the consumer a fair rate for his water, to help pay both for the cost of the project and for its maintenance. In other cases, however, the benefits of the improvements cannot be compensated for in this manner, and it may be necessary to proceed to special assessments against benefited property. This principle is already recognized in Article 8 of the law relating to highways within municipalities, which, in translation, reads as follows:

> "If the value of a property should, as a result of the actions taken by the municipality for the extension of the city thoroughfares, increase more than 10 per cent, this increase of value shall be evaluated by an expert, according to the provisions of Article 4, and the proprietor shall be held to pay a sum equivalent to one-third of this increase of value to the municipality in cash or in installments."

It is understood that this law has not worked out satisfactorily, as a single payment in the amount of one-third of the increased value, if actually enforced, would in many cases compel the sale of a substantial part of the property affected. Possibly a payment over a period of years commensurate with the benefits received, in the form of a tax rather than a capital levy, would prove more practical and more easily collectible.

In order to indicate more precisely the type of legislation we believe should be enacted, we give a detailed outline below of suggested principles for new legislation to permit the Government to acquire property for public purposes.

1. Authority

The power to acquire property for public purposes should be exercised by the Government, acting through decrees of the Council of Ministers. The Council of Ministers should have the authority to delegate the exercise of this power to the appropriate Ministers for specific projects or for particular groups or types of projects.

The Government should have the authority, likewise, to delegate this right of acquisition to the Plan Organization for the Seven Year Plan with respect to projects to be carried out under the Plan, or to other Govern-

ment agencies or corporations. Where public works are to be carried out by private organizations, we suggest that the power of acquisition be exercised through the Government or a Government agency for account of the private organization. Where a private organization is exercising a function of public interest, the Government or the Government agency concerned should be bound to proceed with the acquisition of the property for such organization, upon due application, unless positive public findings are made that the acquisition is inappropriate or unnecessary.

Within the area of its competence, each municipality should have the same right of acquisition as the National Government.

2. Purposes

a. Water works and systems, wells, reservoirs, dams, canals, sewage, sewage disposal plants, hydraulic works, improvement of rivers, streams, etc., and all works required for the betterment of the water and the water power system of the country.

b. Electric power and gas systems, electric transmission lines, underground cables, pipe lines for oil, gas, and power, plant sites, and rights of way over and along highways and easements.

c. Telegraph and telephone systems with their installations, buildings, and poles; rights-of-way for over and underground installations and for submarine and overhead crossings of navigable waters incident to such systems; land for radio stations.

d. Railways, highways, roads, ports and port facilities, and aviation fields.

e. Necessary forest reservations, agricultural experiment stations and demonstration farms.

f. Public buildings and the essential requirements for national defense.

g. Social improvements including low cost housing projects, schools, hospitals, prisons, public squares and parks, slum clearance, and the removal of structures dangerous to public health or safety.

h. All public purposes necessary or appropriate to carry out the works and betterments mentioned above.

[NOTE: No suggestions are included here respecting the general agricultural situation, or mining, as it is felt that these should have separate treatment.]

In specifying the property (the term as used herein includes land, buildings, rights-of-way, easements, etc.) to be acquired, the acquiring authority should clearly and publicly set forth the public need therefor and establish the fact that the particular property to be taken is necessary to meet that public need and that the property taken is the minimum reasonably required therefor.

3. Procedure

Upon appropriate determination as indicated in 1 above that specific private property should be acquired for one or more of the purposes outlined in 2, the acquiring authority should notify the owner stating the precise property to be acquired, and what the acquiring authority is prepared to pay therefor. Notice should be given to the owner at his last known address. If

the owner is absent from the country, unknown or unreachable, notice by publication in the Official Journal should suffice.

The parties would then have (blank) days to agree among themselves as to a fair price of acquisition. In case of failure to agree they should thereafter have (blank) days to determine valuation by the usual system of arbitration. (It is suggested that each of the above periods be limited to about 30 days.)

Unless agreement is reached within the period aforesaid, then the acquiring authority should be entitled to submit the record to the appropriate court and to receive promptly from such court a judgment decreeing the condemnation of the property. The acquiring authority, upon payment to the owner, or to the court if the owner is unavailable or unknown, of two-thirds of the the amount offered in the original notification, would then become full owner thereof and the former owner would be entitled to have the full valuation of his property determined by the court and paid within a fixed period. Payment by the acquiring authority of the price so determined would satisfy any mortgage or other rights of third parties, but lien holders should be entitled to adequate notice. The acquiring authority should cause any land acquired to be registered in the Land Register.

A simplified method of procedure should be worked out with respect to property owned by the Government itself or by Pious Foundations.

In fixing valuation for the acquisition of private property, the basis should be the fair value, at the time of the taking, of comparable property in the vicinity, but without giving effect to any enhancement in the value of the property taken due to the projected public improvements for which the property is being taken.

Consideration should also be given to inserting, in a special chapter of the law, a provision which would take account of the increase in value of property by virtue of public improvements. This might be done by requiring the benefited owner (if his benefit exceeds a fixed percentage of the previous value of his property, say, 10 per cent) to pay by way of tax or contribution over a period of years a percentage of the benefit received. We recognize that any such tax or contribution would be difficult of enforcement, and further study might be required before definite recommendations are made. (In this case it would be preferable to proceed immediately with the law on acquisition and provide in a separate law for the tax on the "enrichment" resulting from public works.)

TAX REFORM

Under the Seven Year Plan, substantial revenues, particularly certain AIOC payments, which now enter into the ordinary budget, will be devoted to carrying out the Plan. Also to counteract the inflationary tendencies of the Plan, more fully discussed in the economic section of the report, it will be important to reduce indirect taxes on essential products which affect particularly the cost of living of the less wealthy. If the campaign to save the forests of the country and to encourage reforestation is to succeed, it is vitally important to reduce the cost and increase the availability of fuels other than wood—kerosene, for example. One way to do this is to reduce certain excise taxes. Finally, if the Plan is to make its full contribution toward raising the standard of living, the present inequitable system of indirect taxation, which unduly increases the cost of the necessities of life, must be reformed. New revenues should be found by direct taxation of those best able to support it.

Irregularities and graft in the tax collection system are also tending to drive capital out of the country and are an obvious deterrent to the investment of local capital in any long-range projects.

From this, only one conclusion can be drawn. If the Plan is to be on a sound financial basis, there is vital need for a thorough reform of the tax system, including an increase in the return from direct taxes and a reduction of indirect taxes, and in particular there must be a reform of the tax collection system.

Direct taxation, that is to say, taxation on rents and the produce of land, on incomes —individual and corporate—and on inheritances, amounted in 1948 to only approximately 13 per cent of the revenues of the Government. In the United States, for example, Federal income tax, personal and corporate, alone accounted for more than 70 per cent of the Federal income over the five-year period ended June 30, 1948.

We do not suggest that western methods of taxation can or should be introduced all at once in Iran. It is fair to point out, however, that the existing tax structure in Iran is not well adapted both to support the cost of Government and to contribute toward the financing of a comprehensive plan of economic development. Certainly such costs should not be largely borne by taxes which increase the cost of living and tend to reduce the living standards of the less wealthy.

A project of law is now under consideration which attempts to bring some order out of the present chaotic situation with respect to the levying of taxes on income. Unfortunately, the almost universally expressed skepticism as to the enforceability of any law for the collection of direct taxes leads to the conclusion that it is the administration of the system and not merely tax legislation which requires reform.

In fact, the entire tax system of Iran, indirect as well as direct taxation, is long overdue for a thorough overhauling. With the aid of foreign tax experts, a prompt study should be made with a view to submitting precise recommendations which, among other points, should include proposals for: (1) augmenting the return from the direct taxes, particularly the income tax, (2) a tax on real property, within municipalities, for the support of municipal and local government, (3) the taxation of certain types of speculative capital gains, and finally and most important, (4) a complete reform of the tax collection system.

Without awaiting the completion of this study, we recommend that there be created immediately a new and special corps of tax collectors who should have thorough training, receive adequate compensation, and be civil servants not subject to appointment by favor or to dismissal except for cause. In general, they should not be permitted to negotiate "deals" with the individual taxpayer so as to put an end to the present unfortunate system where the taxpayers are too often at the mercy of the cupidity of an army of untrained tax collectors who, in turn, too often have received their appointments as political favors without regard for experience or integrity.

The appeal system available today to the taxpayer also requires thorough review. It appears to afford little protection for the honest. In particular, the provision requiring security up to the amount of the tax demanded before a taxpayer can have a final review of his case serves to frighten the citizen from seeking to appeal from the oppressive tactics of the local collectors. The whole effect of the present system and its administration ap-

pears to be that many taxpayers pay no direct tax at all, finding the danger of complete tax evasion less serious than that of falling into the clutches of the tax collector.

Until the system of tax collection is thoroughly reorganized, it will make little difference what direct tax laws may be on the statute books.

In general, we believe that the system of direct taxes should be kept as simple as possible. High rates do not necessarily mean greater return. In fact, under present conditions in Iran high rates may merely increase the measure of uncollectibility of the tax. Finally, instances of tax evasion and of corruption in tax collection should be dealt with sternly as an example to the public.

DECENTRALIZATION OF AUTHORITY

The Seven Year Plan provides for an allocation of expenditures among the various ostans with a view to spreading the advantages of the Plan as fairly as possible throughout the entire country.

If this wise provision is to have results, there must be a greater measure of decentralization with respect both to the execution and to the financing of economic projects under the Plan. This means that the present concentration in Tehran of authority to deal with most of the economic problems of the provinces and municipalities must gradually be changed and a measure of "home rule" in economic affairs must be brought about.

A project of law to give the municipalities a wider degree of local autonomy has been drafted and it is understood that it will shortly be considered by the Majless. This legislation should be reviewed, in the light of the recommendations in this report, to insure that it gives the municipalities the powers required to permit them to co-operate effectively with the Plan Organization and to carry out their duties as local governments.

In particular, projects in the field of public works and social welfare for the benefit of particular municipalities should be supplemented by action taken by the municipalities themselves. In certain cases the municipalities should be called upon to make a substantial financial contribution to the public improvements from which they are to benefit in the field of electric power, water supply, housing, communication, and the like. This, in turn, would mean that the municipalities should have adequate taxing powers. These powers should be clearly defined and the municipalities should be able to exercise them to support the projects of the Plan.

The power of a municipality to collect and disburse taxes for necessary improvements is today largely subject to negotiation between the Ministry of the Interior and the particular municipality. The amount of tax collected by a municipality may depend largely upon the vigor and energy of the municipal mayor in his dealings with the Ministry of the Interior in seeking for his municipality a fair share of taxes collected locally. But as the mayor, and in effect his municipal council as well, are appointees of that Ministry, their ability adequately to represent the municipality is curtailed. In most cases the taxes are collected by the central Government and a certain share turned over to the municipality.

Thus the municipal tax system is a mere adjunct of the national tax system, giving the municipality little opportunity for developing public services on its own account. Adequate municipal development and proper municipal public services are not likely to result until the municipalities have certain fields of taxation assigned exclusively to them.

In this way, they could establish the necessary independent municipal responsibility. This would give the able and aggressive mayor, with his municipal council, the necessary freedom to develop civic improvements and the municipalities would then be better equipped to supplement the aid which they may receive under the Plan.

It is recognized that there is in Iran serious opposition to a direct tax on real property. However, such a tax, reinforced by the right to create municipal debt for long-range public projects, is the obvious way to finance sound municipal government. While no direct tax has been easy to collect in Iran, this type of tax should present fewer difficulties than would an income tax. With proper exemptions for low-cost housing, and possibly for new industrial developments, it would be collected from those best able to pay and from those who would benefit most directly from good municipal government. If publicity were given to all tax assessments, the opportunities for fraud would be rendered more difficult. Even with low tax rates on real property, a sufficient tax should be collectible to make it possible for the municipalities to eliminate the existing harassing taxes on the commodities essential to the poor and establish a sounder basis for financing local improvements.

We understand that only the central Government and the municipal governments have "juridical personality". The other political subdivisions of the country, including the ostans, depend administratively on the central Government. It is not the function of this report to deal with the political organization of Iran. However, if towns and villages which do not enjoy the status of municipalities were given a greater measure of authority in the economic sphere, it would help toward sounder local development which is so essential to national life.

NATURAL RESOURCES

New legislation will be required to protect and develop the natural resources of Iran. This is particularly true as regards the development of water resources, irrigation projects, and the protection of the forests. Detailed recommendations are contained in the sections of this report dealing with these subjects.

Water

For an agricultural country such as Iran, water is the most vital national asset. The right of the State to provide for the adequate development of the water resources for the public good is basic to the development of Iranian national life. The provisions of the civil code as to water rights (see Art. 148-160) are based largely on ancient custom and on the waterway system of kanats. It is not adequate for present needs, since it is limited largely to regulating the personal rights of the individual to water and rights as between individual claimants to water. It does not deal with the basic problems of the development of major projects in the public interest.

Control of the water supply from major rivers, dams, irrigation projects and the like should be under the supervision of the State except where, under grants from the State and with adequate supervision, private enterprise is brought in. Existing property rights in water should, of course, be respected except to the extent that overriding public policy calls for the exercise of the right of the State to take property for public purposes.

Where private water rights affect substantial numbers of persons, the right of State regulation should be sanctioned by law.

Laws should also be enacted covering the right to regulate the equitable distribution of water from rivers and any waterways of public interest as well as from irrigation projects, dams, canals, and the like, resulting from public improvements under the Plan or otherwise. Authority to exercise such control should be vested in the national Government, acting through a Central Water Authority, which would then replace the Independent Irrigation Corporation, described below. Of course, municipal or local authority should have a measure of control within its confines, subject to the Central Water Authority as to matters of more than local interest. Where water projects are to be carried out by the Plan Organization, arrangements should be worked out between the Plan Organization and the Water Authority respecting control during and immediately following the period of construction.

A start was made toward better co-ordination of such projects through the organization on 29 Ordibehesht 1322 of the Independent Irrigation Corporation under the supervision of the Ministry of Agriculture. This department, assuming that it becomes the Central Water Authority, should be strengthened and given new powers and financial resources so that, in conjunction with the Plan Organization, it may be prepared to facilitate the execution of the Plan in the whole area of water power and irrigation, as more fully described elsewhere in this report.

Mining (Exclusive of Oil)

Relatively little prospecting has been done in Iran, and every effort should be made to encourage the work of discovery and to facilitate the development of discoveries made. In the light of these needs, the existing mining law of 23 Bahman 1317 requires review and revision. The restrictions in the law regarding the conditions of exploitation should be eased and the discoverer, assuming he does not become the exploiter of the discovery, should have a more readily realizable reward for his discovery than the one-half of one per cent of the gross provided under existing law. For example, it is not unusual for the discoverer to share, on an equal basis, with the landowner in all rights to the discovery where the landowner is a private party. If the government is the landowner, then the discoverer should have exclusive mining rights within a fixed and determined area, subject to the maintenance of his claims only if a required minimum expenditure is made on development.

There is also in the mining law a superfluity of governmental red tape, and the law as a whole could well be simplified.

Forests

The protection of the forests and reforestation are among the most pressing needs of the country. A rather detailed law on the subject is on the statute book and an Administration of the Forests has been created for the enforcement of this law by decree of the Ministry of Agriculture. There is also on foot a project to establish a special "authority" for forest protection. Unfortunately, the law is most difficult of enforcement under present conditions.

The desperate shortage of fuel has created an economic urge such that any law to protect the forests would be relatively ineffective. And laws have little control over the voracious appetite of the itinerant and destructive goat.

The most effective steps to protect the forests of Iran are of an economic rather than a legal nature. If cheaper fuel can be made available, it will ease the economic urge which drives the peasant to destroy the forest to make charcoal for his own needs and for sale to the cities. It is suggested, therefore, that this is the first line of attack. The second is to build up the Forest Administration so that it can better control and reinforce the measures to prevent the destruction of Iran's forests.

LAND TENURE

The system of land tenure in Iran has undergone little change over the centuries. To say that it is archaic is an understatement. However, this system is now so embedded in custom and in the life of the people that it cannot wisely be changed overnight. To attempt this might bring famine, chaos in agricultural relationships, and in the long run would not benefit the peasant. The fact that certain European countries have effected land reform by legislation more or less abruptly, though with varying degrees of success, does not mean that in a country such as Iran similar laws would be either wise or efficacious.

It is generally conceded, however, that there is a pressing need to work toward the gradual emancipation of the peasant from the present type of feudal control by the generally absentee landowner. This does not mean that a landlord-tenant relationship in itself is evil and must be wholly eliminated. There are many public-spirited landowners in Iran who have the interest of the peasant at heart. It does mean, however, that a reform in existing land tenure relationship as it exists today in Iran is necessary if the agricultural aid proposed to be extended under the Plan is to bring lasting improvement.

To illustrate, it would be futile if the agricultural aid under the Plan merely enriched the landowner and increased his power. If, on the other hand, agricultural equipment and other aid were today turned over to the peasants, with their present lack of organization and experience they would be incapable of using it adequately or maintaining it, and the resources of the Plan would be dissipated to no purpose.

This question, in most of its phases, is a practical rather than a legal one and is dealt with more fully in the agriculture section of this report (Vol. III). There are, however, certain legal phases which should have immediate attention. For example, there is need for legislation to facilitate the establishment of farm co-operatives. Such co-operatives could take over certain farm machinery and equipment and see to their use and maintenance for the general good. We understand that a project of law on farm co-operatives is now under study.

A study should also be made to ascertain what type of legislation could be adopted to facilitate the acquisition by the peasants of untilled and neglected land which should be made available for cultivation. In this way, the peasant could gradually acquire rights of ownership upon the payment of reasonable compensation to the private owner who fails to develop his land, if the owner can be found, or to the State in case the land is State land or has no owner. The fact that the State is a large landowner should enable it to make a prompt start along these lines with certain of the State lands.

A rather ineffective step to do something about this situation was made in the Law of 25 Aban 1316 on the General Improvement of the Land, but even this law has not been generally enforced.

It would serve no purpose to give modern farm equipment to the Iranian peasant until he has the opportunity to cultivate many times the amount of land now available to him. If the individual peasant is limited, as is the usual case today, to the cultivation of some four hectares of land, he can never acquire any real measure of economic independence. It makes relatively little difference whether he cultivates that land for the landed proprietor and pays a tribute in the form of a division of crops to the proprietor, with the protection and security which the feudal serf enjoys, or whether he takes the whole of the crop as landowner without the protection and security of working for a proprietor. In either case, it is merely a question of degree of poverty. Once, however, the possible area of cultivation is increased substantially, as can be done by modern machinery, then the peasant with some training in the use of modern farm machinery can work toward a measure of economic independence, the ownership of some land, and freedom from servitude. Laws to encourage development along these lines should be the subject of immediate study.

Under proper regulation, farm co-operatives mentioned above can also serve to protect the peasant from the nefarious operations of itinerant or local vendors. The latter control the sale of the basic necessities which the peasant needs for livelihood in addition to his own crops, for example, sugar and tea. Too often they take advantage of their monopoly to exact an exorbitant price in terms of a share of the peasant's crop. The peasants should receive these necessities at the lowest possible price from their own co-operatives under arrangements whereby the co-operatives themselves purchase such staples in bulk at fair prices.

Certainly one of the primary objectives of the Seven Year Plan should be to register real progress toward giving the Iranian peasant greater security and freedom.

INSTRUMENTALITIES

Most of the projects to be developed under the Plan will be financed by the Plan Organization, at least in their early stages. Hence the Plan Organization, or possibly in certain cases the interested Ministry or Governmental authority, will take over the control and management of such projects or at least will assume the duty for installing the management and must accept the ultimate responsibility therefor. If the project is to be carried out through a corporation, then either the Plan Organization or the Government agency concerned will become a stockholder, in many cases the sole stockholder. It is assumed that such Government ownership will frequently be of a transitory nature until the project can be taken over by private enterprise.

This method of Government management, whether in corporate or unincorporated form, generally known as the "bungah", is very familiar under Iranian legal procedure. It has, however, shown grave difficulties in many instances, as particularly evidenced by the highly unsatisfactory results of the Government-owned Industrial and Mining Bank, for example, which is discussed in more detail elsewhere in this report.

These difficulties are the result rather of the failure of management, human failures, than of any inherent defects in the legal structure. The Iranian corporation law (Title

3, Article 20—222 of the Commercial Code) furnishes a reasonably satisfactory and flexible basis for corporate organization and corporate control. This code follows the familiar pattern of the continental European system.

No code, however, can effectively prevent maladministration. Such maladministration has cropped up in most of the Government-run enterprises, and it has made little difference whether these enterprises were incorporated under special law, under the corporation code or administered as unincorporated "authorities". Where all the stock (or administrative control, if in unincorporated form) is in Government hands, the usual checks on management which should be exercised by an independent board of directors and by stockholders are totally lacking. Today, with respect to such Government enterprises, there are no adequate accounting procedures and no adequate requirements for publicity with respect to the company's affairs. This situation inevitably leads to laxness and irresponsibility, if not worse.

RECOMMENDATIONS

Throughout this section are certain general recommendations respecting laws and future legislation, taxation, and such matters. We set forth below some recommendations for safeguards to be adopted for the protection of the Plan Organization in cases where it undertakes new projects or responsibility for existing projects. Legislation to require such safeguards with respect to all Government-controlled enterprises should be formulated for early submission to the Majless. These safeguards should apply to all types of Government-controlled enterprises of whatever form where the Government goes into the field of business enterprise.

Balance sheets and income statements should be published semi-annually and there should be some form of certificate by an independent accountant.

An annual report of operations, including publicity for all contracts except routine contracts in the ordinary course of business, should be published.

No director or administrator should participate in any transaction in which he or any relative has any interest, and any such interest must be disclosed in the records of the proceedings.

One or more paid outside directors should be added to the Board of Directors to protect the interests of the public.

There should be a separate corporation or agency to handle each particular project of importance, or group of integrated projects, so as to avoid the failures of management which result, as in the case of the Industrial and Mining Bank, where top management attempts to handle a variety of projects differing in character and geographically separated.

In the case of projects initiated under the Plan but carried out by other Government agencies, a part of the share capital should be retained by the Plan Organization so as to give it the right to adequate representation on the Board and to inspect the books and records of the enterprise at all times.

One of the existing difficulties in Iran in connection with the operation of corporate business enterprises is the lack of an adequate corps of trained public accountants. The accounts of the Government-owned and of most private corporations are in such condition that it is almost impossible to analyze the financial position of the company or to

determine where losses have occurred or gains have been realized. It is important to take steps to start the training of Iranian youth in accounting practices, and it is suggested that a certain number of students be sent abroad to learn the principles of accounting, pending the establishment in Iran of more adequate facilities for teaching accounting in the country. The profession should also be given standing under adequate laws prescribing the training and qualifications required of public accountants.

Our study of the Iranian legal structure has made it demonstrably clear that the chief obstacle to be encountered on the legal side in carrying out the Plan is not the absence or the inadequacy of law. It is the lack of respect for law and the failures in the administration of law. There are many excellent laws on the statute books which can well be invoked to carry out the development program. A large share of these laws, according to the almost universal testimony of persons consulted, are not being adequately administered. Many are quite generally disrespected.

As the Plan develops, it will be important not to overburden the statute books with new laws until the need for them is clearly demonstrated. It will be even more important to see to it that, as new laws are passed in aid of the Plan, adequate administrative machinery is built up for their enforcement. In this way, the legislation initiated by the Plan Organization, as the need arises, might help to build up respect for law.

In the light of these considerations, we have outlined above certain measures which we feel are important to adapt the Iranian legal system to the requirements of the Plan.

ECONOMIC PROBLEMS

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ECONOMIC PROBLEMS

FUNDAMENTAL CONSIDERATIONS

It is important to point out at the beginning of this section of our report that it does not purport to express judgments on the banking, currency, and credit structure of Iran. A critical examination of this structure would have required analyses of far greater scope than were possible under the circumstances. We have therefore studied the potential impact of the Seven Year Plan proposals, taking the financial structure as it is. Our recommendations regarding the economic aspects of the Plan are based on sound, practical considerations. They are made with the idea of keeping at a minimum the adverse effects of Plan financing on the Iranian economy.

The financing of the Seven Year Plan divides naturally into two parts, namely, the provision of the necessary funds, and how such funds are to be spent without an unduly severe impact on the economy of Iran. The enabling act proposes the provision of necessary funds from certain sources, and also proposes the expenditure of these funds according to an itemized program with both chronological and geographical subdivisions. Under these broad provisions, the Plan Organization has the responsibility for the proper administration of expenditures. It is evident that the carrying out of the Seven Year Plan is subject to the same general considerations which any government must recognize in possessing itself of necessary funds and then spending them on a national program. The financing and execution of a war effort, for instance, requires such recognition, and in many respects is simpler than a great peacetime work like the Seven Year Plan because patriotic emotion unifies a people as nothing else does. But whether a war effort or a peacetime program is involved, there are fundamental considerations which must be recognized and faced squarely if the work is to be done satisfactorily from the point of view of its impact on a nation's economy. We shall therefore begin with a statement of what we believe these major fundamentals to be, with particular reference to the Seven Year Plan, as follows:

1. A government is responsible to its people for keeping the purchasing power of its money as stable as possible. Put another way, a government should adopt financial policies which will not aggravate inflationary tendencies.
2. A government must acquire purchasing power to spend on carrying out its government functions in the interest of its people. A sound system of taxation is usually the best means of acquiring such purchasing power from its people. Since taxation transfers purchasing power from the people to the government, and does not add to the total of purchasing power in existence at any given period, it need not be inflationary.
3. A government can acquire purchasing power by borrowing it from its citizens. Insofar as this operation involves merely a transfer of purchasing power from the people to the government, it need not be inflationary. However, if the citizen holder of a government bond takes it to a bank and borrows on it as collateral, the purchasing power in the hands of the public is largely re-established and the result may be inflationary.
4. A government can acquire purchasing power by borrowing from its banks. This is an easy way of putting additional purchasing power into the hands of the government without subtracting it from the public's supply. If carried out in substantial volume, the spending of it can easily create inflation. The reason is that the government enters the domestic market for

goods and services as an additional competitor, using this newly acquired purchasing power in a situation where the public's purchasing power has not been reduced.

5. A government can acquire purchasing power by borrowing abroad from foreign agencies or individuals. Such purchasing power will ordinarily be in the form of foreign currencies. Spent abroad on capital goods for import, it will not tend to inflate the economy. If spent abroad on consumer goods for import, it will tend to absorb some of the public's domestic purchasing power and will not be inflationary. It should be noted that imports of foreign merchandise may have a serious competitive effect on domestic industry in the same lines. It should also be noted that foreign loans have to be serviced and repaid in foreign currency.

6. A government can acquire purchasing power by printing paper money and using it to purchase goods and services in the domestic market in competition with the public. This is the phenomenon of "fiat" money and the process is always dangerous. It adds to the volume of the circulating medium at the same time that it subtracts from the volume of goods and services competitively available in the market. It is the easiest road to inflation.

   In this connection, it must be kept in mind that the total volume of circulating medium of a country consists not only of currency, but also of its bank deposits. If the public deposits currency in the banks, the total money in the hands of the public goes down and bank deposits go up. When the public needs currency, it draws down its deposit balances and the volume of money in the hands of the public goes up correspondingly. The normal functions of regulating the volume of a note issue constitute something entirely apart from the question of so-called "fiat" money just mentioned. It is not the purpose of this report to discuss the problem of note volume regulation, but merely to point out that for any government to print money as such to spend for the acquisition of goods and services has always been and will continue to be an unsound practice. It is included in this discussion of fundamental principles for the sake of completeness.

7. A government can acquire purchasing power by disposing of assets owned by it, such as public lands. This subtracts purchasing power from the public and puts properties into circulation. It is a legitimate operation for putting purchasing power into the hands of the government and need not be inflationary.

8. A government can acquire purchasing power by the successful and profitable operation of a business owned by it. Whether or not such government operation in competition with private enterprise is desirable is not the question here. However, as government enterprises in any country are generally inefficient, the purchasing power thus acquired is not apt to be large.

9. A government can acquire purchasing power by the collection of import duties. Raising funds in this manner is a recognized and legitimate contribution to government income. The test of its soundness lies in its effect on the national economy and no generalizations would be worth while at this point.

10. A government can acquire purchasing power by the imposition of export duties. This is of primary importance where a country is a large producer of some world staple which commands a wide international market. It is especially important in the case of Iran with its exploitable petroleum resources. However, there are certain unavoidable complications implicit in such operation. The product is produced domestically with a great part of the expenses of production necessarily paid for in the domestic currency.

The product is sold internationally and paid for in foreign currencies. The export duties (royalties) and dividends are payable in foreign currencies. These payments will go to increase the government's balances of foreign currencies. The government may spend them abroad, or leave them in its foreign currency deposit assets, or exchange them for domestic currency deposit assets. If they are not spent, their retention as foreign currency deposits will not affect the domestic economy adversely.

The foreign deposit assets exchanged by a government for domestic deposit assets can affect the domestic economy adversely if the domestic deposit assets are spent by the government for ordinary running expenses. Unless they are spent to produce consumer goods, or the foreign exchange sold by the government to acquire them is sold to importers and used to import consumer goods, the effect will be to inflate the domestic economy.

The foreign currency received by the government or domestic bank in exchange for the domestic currency needed by a producing company for current running expenses also can affect the domestic economy adversely. Unless the foreign currency thus received is sold to importers for bringing in foreign consumer goods for domestic sale, the effect will be cumulatively to inflate the domestic circulating medium; it should not be spent for Plan purchases. However, it must be kept in mind that these conversions of foreign currency sales income in sufficient measure to pay domestic running expenses of the producing company are absolutely necessary if production of the exportable commodity is to be maintained.

11. A government may add to its balance of purchasing power available for the prosecution of a work like the Seven Year Plan by reducing or eliminating unnecessary or unproductive items in its current budget. Likewise, it may add to its resources available for the prosecution of such a work by diverting part of its conventional expenditures into the directed effort.

This summary of fundamentals is presented at the beginning of this section of the report because many of them are all too often lost sight of in the activities of governments. In the case of Iran, it is important that the high hopes of the Iranian people for the success of the Seven Year Plan shall not be dimmed or handicapped by lack of recognition of them.

Iran's economic future is closely tied up with its oil resources. The money product of these is at present in sterling, which is convertible under certain conditions, with royalty and other accretions currently adding to an already accumulated balance. Under the Seven Year Plan law, oil royalty and dividend payments are to be earmarked for the execution of this program, thus providing a continuing source of foreign exchange in addition to the Government's present balances on the books of foreign banks.

An important characteristic of these foreign payments is that they may be spent abroad on goods for account of the Plan without direct inflationary effects on the Iranian economy. It is not until such foreign purchases are brought into Iran, and rial expenditures have to be made to transport and install them, that they may produce an inflationary effect. On the other hand, goods and services acquired by the Government in Iran may tend immediately to cause inflationary pressure because they subtract from the supplies domestically available, and put money directly into circulation.

These domestic inflationary pressures must be controlled, both because they tend to increase the general cost of living and also because they will increase the cost of the Seven Year Plan if they are allowed to develop. At this point it should be clearly stated

that the maximum rate at which the Plan can be executed safely will be determined by two closely related factors:

1. The rate at which rial purchasing power can be mobilized by the Government to spend on the plan.
2. The rate at which these rial expenditures can be made without forcing up prices unduly.

It should be recognized and adopted as a fundamental policy that the Plan must not be allowed to drive up prices to substantially higher levels.

The economic and financial problems of any country are complex, involving as they do all the many activities of the people plus the fundamental factor of human nature. If the Seven Year Plan is wisely guided, administered, and controlled, it can prove of inestimable value to the people of Iran. If it is not, the funds may be dissipated and the planned results will not be accomplished. Guidance, administration, and control are not easy of accomplishment. Individual selfishness and greed on the part of some, plus incompetence, misguided enthusiasm, and political pressures, all can reduce the accomplishment of the Plan. These facts must be recognized by the Government of Iran, by the officers of the Plan itself, and by the people. A new Iran can evolve gradually with the help of the Plan as it becomes an integral part of Iran, and not merely a superimposed entity.

DISCUSSION OF ECONOMIC ASPECTS

The economic aspects of the Plan which are treated herein can best be discussed under the following headings:

The supply of foreign exchange
The supply of rials
The nature of expenditures made with foreign exchange
The nature of expenditures made with rials
The effect of foreign exchange expenditures
The effect of rial expenditures
The control of expenditures in relation to
a. the carrying out of the Plan
b. the economic stability of Iran.

Since the Bank Melli is the national bank of Iran and is owned by the Government, in the following discussion it is unnecessary to specify whether certain ownerships are vested in the Bank as such or in the Government.

The attempt has been made to have the statistical figures used in this report accurate, adequate, and representative. However, in view of the specialized nature of the accounting procedures from which the figures had to be drawn, the extent to which foreign exchange valuations are involved, and the necessity for translation of pertinent data from Farsi into English, no comprehensive checking or auditing of the figures has been possible.

THE SUPPLY OF FOREIGN EXCHANGE

The potential supply of foreign exchange may be detailed as follows:

1. The present free foreign exchange holdings of the Government;
2. Gold, the international currency, owned by the Iranian Government and held in its own national bank, or for its account in other countries;
3. Any excess of Iranian exports over imports, which would gradually add to the foreign exchange bank balances as the Government acquires the resulting exchange;
4. Current income from the oil royalties or dividends paid to Iran by the Anglo Iranian Oil Company (AIOC);
5. Sterling payments by AIOC made against rial conversions;
6. Foreign securities owned by the Iranian Government;
7. A loan of foreign currency by some foreign agency.

In the discussion on foreign exchange matters which follow in this section of our report, the official exchange rates of Rls. 32.5 to the dollar and Rls. 130 to the pound will be used unless otherwise stated. While these may not be realistic under present conditions, it is necessary to have a standard reference rate throughout the report and these standard rates have been used for that reason.

Foreign Exchange Balance

The foreign exchange balance as of 29 Esfand 1327 (March 1949) and its principal sources are shown below:

Unit	Amount	Dollar Equivalent	Rial Equivalent
Dollars	24,593,075	24,593,075	799,274,938
Pounds sterling	26,801,600	107,206,400	3,484,208,000
Swiss francs	552,400	126,627	4,115,380
Other currencies	—	976,074	31,722,400
		132,902,176	4,319,320,718

Some of this foreign exchange, namely, the equivalent of Rls. 1,718,049,520, is earmarked in the Issue Department of the Bank as part of the currency reserve cover, leaving the equivalent of Rls. 2,601,271,198 free as of 29 Esfand 1327.

It should be likewise stated that the balance standing in Iran's favor on the books of the Soviet Treasury is in a different category from the other items as regards availability.

Iran has the following debts owed abroad as of 29 Esfand 1327. These are all dollar debts:

	Dollars	Rial Equivalent
For purchases of U. S. Army materials	2,792,758.47	90,764,650
For lend-lease materials	711,753.36	23,131,984
For Abadan aerodrome	136,682.00	4,442,165
Total	3,641,193.83	118,338,799

There is in addition a credit granted for the purchase of U. S. Army Materials for $26,000,000. A small amount of this credit has been used.

Gold Holdings

	Amount (Grams)	Rial Equivalent	Dollar Equivalent
Gold in vaults of Bank Melli	40,755,236	1,486,882,225	45,750,222
Gold on deposit abroad	90,808,391	3,312,746,976	101,930,676
Total	131,563,627	4,799,629,201	147,680,898
Of which gold owed to Iran by USSR amounts to	11,196,700	408,448,650	12,567,651
Net	120,366,927	4,391,180,551	135,113,247

In addition to this gold, Iran has large but unvalued assets in the crown jewels, carried in the Issue Department of the Bank Melli as part of the reserve cover for the note issue at the amount of Rls. 344,201,581. For the purpose of this report, this will not be considered as a foreign exchange asset.

Excess of Exports over Imports

This has, of course, been a negative excess for some years in that the imports have exceeded the exports. The oil exports and products of the fishing concession exploited by the Russians are excluded from the category of exports in this table.

	In Millions of Rials		
Year	Imports	Exports	Excess of Imports Over Exports
1322	1,527	704	823
1323	2,957	792	2,165
1324	3,106	1,698	1,408
1325	4,115	2,570	1,545
1326	4,706	2,324	2,382
1327	4,226	1,798	2,428

After the war years there was a great dearth both of capital goods and consumer goods in Iran which needed to be supplied. In view of the requirements of the Seven Year Plan for foreign exchange, the test should be increasingly applied to imports as to whether or not they contribute to the success of the Plan. However, in attempting to judge the supply of foreign exchange available for the Plan, we have assumed that the pattern of excesses of imports over exports will probably continue in the future.

AIOC Oil Royalties and Dividends

This income is tabulated below for the last seven years. Since the sterling amounts are convertible into dollars under certain conditions by special arrangement with the Bank of England, the figures are shown in sterling, dollars, and rials.

English Calendar Year	Thousands of Pounds Sterling — Royalties	Taxes	Dividends	Total	Equivalent Dollars in thousands at $4 To Pound	Equivalent Rials in thousands at Rls. 130 To Pound
1941	2,631	568	834	4,033	16,132	524,290
1942	2,678	454	924	4,056	16,224	527,280
1943	2,525	606	918	4,049	16,196	526,370
1944	3,277	514	728	4,519	18,076	587,470
1945	4,305	646	728	5,679	22,716	738,270
1946	5,287	768	1,126	7,181	28,724	933,530
1947	5,262	765	1,126	7,153	28,612	929,890
Seven year totals	25,965	4,321	6,384	36,670	146,680	4,767,100

During the years 1320 to 1326 inclusive more than 90 per cent of this sterling income seems to have been converted to rials and used to balance the budget. The rate at which this income will accumulate in the future is, of course, impossible for us to predict. Information furnished to us recently by the Iranian Embassy in Washington, but not yet verified, would indicate that if the new AIOC agreement (not yet ratified by the Majless) had been in effect for the year 1948, current sterling income from AIOC in that year would have been very much higher than in any previous year. Furthermore, a substantial lump sum payment for back royalties apparently is also to be received.

Sale of Rials to AIOC

Since the income of AIOC from the sale of its products abroad is in sterling, the company has to have rials to pay its employees in Iran, and for domestic purchases. Accordingly, the Government through Iranian banks has bought such sterling from AIOC in the following amounts over the last nine years:

Year	Pounds	Rate	Rials
1319	651,337	64.48	41,998,210
1320	365,216	102.36	37,383,510
1321	376,359	129.58	48,768,599
1322	2,611,000	128	334,208,000
1323	3,580,000	128	458,240,000
1324	4,475,000	128	572,800,000
1325	10,300,000	128	1,318,400,000
1326	12,430,000	128	1,591,040,000
1327	16,160,000	128	2,068,480,000

AIOC imports machinery and supplies from abroad for its Iranian operations, and also consumer goods for the company stores. Such payments are made in foreign currencies and hence do not of themselves directly affect the Iranian economy. When machinery and equipment come in, however, they require installation which involves rial expenditures made out of the rial balances acquired as above. We understand that employee store inventories are bought abroad in foreign currencies but paid for at retail by the employees in rials. This then means that to the extent of such purchases in rials by employees, goods are provided to absorb, at least in part, the rial payments for labor. The domestic sales of AIOC petroleum products have a similar effect.

It was indicated in the tenth point of the statement of fundamental principles that, unless the foreign currency purchased by Iran against the rial running expense requirements of AIOC and the royalty exchange converted by the Government for its own running

expenses are sold to importers, and corresponding amounts of goods brought into the country and sold to the public, there will be a cumulative possibility of undue expansion of the domestic circulating medium. While it is difficult to get all of the figures which bear on this phase of the Iranian economy, it is interesting to note that during the last three Iranian calendar years, purchases of foreign exchange by Iranian banks have exceeded sales by an amount equivalent to Rls. 1,485,000,000. During the same three years the currency in circulation has remained about the same, but bank deposits less outstanding loans have gone up about Rls. 1,200,000,000.

It seems worth while to point out here that the basic enabling legislation for the Plan contemplated that "all the Government revenues from the payments made by AIOC shall be earmarked for the execution of the program. At the expiration of the seven year period the aforementioned revenues shall be earmarked for the payment of interest and amortization of loans obtained by law for the execution of the program." It must be assumed that, while the oil royalties and dividends are included in the above as "revenues," the exchange-rial transactions for AIOC current operations are excluded as revenue.

It should also be brought out that while at present the world supply-demand relationship makes AIOC petroleum products of great importance, this may not always be the case. In other words, the possibility of decreased income from AIOC royalty and dividend payments to Iran should be realized in considering the long look ahead.

Foreign Securities Owned

The amount of these is relatively small, and they are given for the completeness of analysis. Since the Bank Melli balance sheet item of "Bills Receivable" as of 29 Esfand 1327 also contains some foreign currency items, they are included below.

	Pounds	Equivalent Dollars at $4 To Pound	Equivalent Rials at Rls. 130 To Pound
Foreign securities	71,789	287,156	9,332,570
Foreign bills receivable (British Treasury bills)	6,385,000	25,540,000	830,050,000
	6,456,789	25,827,156	839,382,570

Foreign Currency Loans

The matter of a foreign currency loan to Iran by the International Bank for Reconstruction and Development seems to have been considered from the beginning of the Seven Year planning as a possibility and even a probability. If the information we have just received and referred to hereinbefore with respect to the revised agreement between AIOC and the Government of Iran is correct, such a loan would not appear necessary from a purely financial standpoint to finance the Government's foreign purchases contemplated in the Plan, provided a reasonable amount of sterling credits can be converted to dollars. For the first few years at least the progress of the Seven Year Plan will be determined, not by the availability of foreign exchange, but by the availability of rials and the rate at which they can be expended within Iran without unduly affecting the price level. If Iran at the moment had a very large loan of dollars from abroad, available for immediate use, it could not be spent effectively to produce the results at which the Seven Year Plan aims. Machinery and equipment could be bought abroad and shipped to Iran without delay, but it would lie useless on the piers and in the warehouses until it could be transported and

installed for use. That takes rial expenditures by the Government, which must be carefully controlled to prevent dangerous inflation. Partially to offset this danger, part of the loan might be used to buy consumer goods abroad and import them for sale to the Iranian people. The sale of such goods would transfer purchasing power from the people into the hands of the Government. While the transferred purchasing power could be used by the Government to pay the rial installation costs of the imported machinery, such purchasing power developed by this means might adversely affect the production and distribution of Iranian-made consumer goods because of the competitive factor, and used in any substantial way would tend to handicap Iranian production. Eventually the dollars would be spent and no more might be available, leaving the country in the position of having handicapped its own domestic productive mechanism and having to rebuild it. Another aspect would be that loans have to be serviced and amortized. They are not generally granted unless there is some reasonable prospect of their eventual repayment. To spend loan dollars for the importation of consumer goods normally would not be looked upon with favor by a creditor.

While we believe a large loan from the International Bank is unnecessary at the present time, we think that one or more loans on specific projects would be beneficial to Iran. By this means Iranians would become familiar with the loan requirements of the Bank, and the Bank would have an opportunity to study conditions in Iran at first hand. Iran would then be in a position to treat for additional loans from time to time as the Plan progresses and the necessity might arise.

Foreign Exchange Summary

The balance of foreign exchange including gold available as of 29 Esfand 1327 (March 1949) may be summarized as follows:

	Equivalent Dollars	Equivalent Rials
Foreign Exchange	132,902,176	4,319,320,718
Gold	135,113,247	4,391,180,551
Foreign Securities and Bills Receivable	25,827,156	839,382,570
	293,842,579	9,549,883,839
Less Debts Owed Abroad	3,641,194	118,338,799
	290,201,385	9,431,545,040
Less Required for Note Cover	185,605,413	6,032,175,939
Net Balance	104,595,972	3,399,369,101

It should be mentioned here that from this net balance should be deducted a sum equal to the minimum foreign exchange balance below which conservative money management would be unwilling to go.

THE SUPPLY OF RIALS

The supply of rials available for the carrying out of the Plan will depend on the present balances available to the Government, plus the additions which can be made available from any and all sources as time goes on.

As regards the present Government rial balances available at 29 Esfand 1327, these can be stated as follows:

		Million Rials
Advances by Bank Melli Iran		3,646
Liability for note issue secured by excess value of crown jewels		1,400
Treasury bonds		427
Loans to Government concerns guaranteed by Ministry of Finance		380
Total indebtedness at Bank Melli		5,853
Less: Fixed deposit with Bank Melli	363	
Sight deposits with Bank Melli	1,622	1,985
Net rial indebtedness to Bank Melli		3,868

Thus it appears that instead of having a rial balance available to finance the Plan, the Government now owes Bank Melli a substantial sum.

The most authoritative statement available with regard to the status of Government revenue-expenditure relationships is contained in the Bank Melli Iran Bulletin No. 96 (Oct.-Nov. 1948). This statement appears on page 128 of the English edition under the title "Iran Has No Budget Deficit."

The essential facts in this statement may be summarized as follows:

> The budget deficit estimated for 1325 (1946-1947) was Rls. 677,000,000, whereas there was an actual surplus of Rls. 153,086,000.
>
> The budget deficit estimated for 1326 (1947-1948) was Rls. 2,203,000,000, whereas the actual deficit was Rls. 57,110,000. The bulletin states that "the actual deficit was the negligible amount of 57 millions which is more than covered by the fact that the Government's oil royalties in sterling in any given year are not shown in the revenues for that year except to the extent that such sterling receipts are converted into rials. In the year in question an amount in sterling considerably in excess of the Rls. 57,000,000 had been received which had not, however, been converted."

Furthermore, the bulletin states:

> "Although in their budget estimates the Government have every year shown a deficit, in actual fact they could not have had a deficit since March 1944 . . . "
>
> "The above statement is borne out by the fact that the Government has not borrowed from Bank Melli Iran since November 1944. The last act which authorized the Bank to lend to the Government was passed in November 1944."

From the foregoing it would appear that the budget has been substantially in balance for the last several years if the revenues from AIOC are included.

If the revenues from AIOC, now used for ordinary budget purposes, are earmarked for Plan expenditures, it will be necessary to find other sources of rials to help finance the operations of government in the years to come, unless the ordinary expenditures of the Government are substantially reduced. Further, it will be necessary to find rials for the

domestic expenditures of the Plan, which for the entire Seven Year period we roughly estimate at Rls. 13,600,000,000.

It is interesting to note that although Government revenues in 1326 were almost five times those of 1315, the index of the cost of living, as published by Bank Melli, increased during the same period from 100 to 784. The index has since increased to over 1,000. The actual income of the Government in terms of purchasing power, as interpreted from this increase, therefore, has actually decreased and the amount of rials which must be found to replace the AIOC revenues and for Plan expenditures may be substantially larger than would appear from the figures shown above. It is recognized that this index number does not apply to Government expenditures, but we believe it to be indicative.

We must now examine the sources and amounts of rial purchasing power which can be made available to the Government for the prosecution of the Seven Year Plan.

Rials from Current Operations

It is a practical impossibility to estimate any definite sum of prospective rial availability from the current operations of the Government. More efficient use of present employees, diversion of surpluses of them to the Plan work, greater production from Government factories, elimination of duplicate expenditures in the Ministries and the Plan, all have possibilities. Until Iran tries the most difficult of operations, introducing efficiency into government, any estimate would be wishful thinking. If the Ministries get back of the Plan program, there can be a surplus of rials available out of the present level of appropriations. How much, and how soon, remains to be seen.

Rial Income from Projects

While at the present time no estimate of potential income from Plan projects can be made which would have any value, it would seem that substantial profits should flow into the Treasury eventually. We see no way in which these can be presently budgeted for the future work of the Plan.

Rial Income from Customs Duties

While undoubtedly better administration of the customs division of the Government might bring in more revenue, it seems unlikely that there will be any substantial additional rial income from this source.

Government Loans from Bank Melli

Article 6, Section 1, of the enabling Act authorizes the Government "to borrow in seven years up to Rls. 4,500,000,000 from Bank Melli Iran, bearing 2 per cent interest per annum. The loan obtained in each year shall not exceed Rls. 750,000,000."

Such authorization must be used with great caution in order not to inflate the domestic economy. It cannot be emphasized too often, nor too strongly, that the maximum rate of carrying out of the Plan must be determined by that rate of Government rial expenditures which will not force up the price level in Iran unduly, thereby increasing the cost of living to the people and the cost of the Plan to the Government. It is our opinion that this authorized borrowing facility should be made use of, if at all, only after the non-inflationary sources of supply have been fully utilized.

Devaluation of the Rial

The present official foreign exchange value of the rial is unrealistic in that it does not represent the rate at which export and import transactions are consummated. The official buying rate for dollars for the period 1 Azar 1327 to 30 Dey 1327 was fixed at Rls. 32 (not including Rls. 0.5 service charge by Bank Melli), whereas unofficially dollars changed hands at rates varying from 50 to 60.

The rial devaluation operation, if consummated, would depend on the note cover requirement for the Issue Department of the Bank Melli. If the present amounts of foreign exchange and gold were to remain unchanged in the Issue Department, and the rial were devalued to something like its present unofficial rate, a substantial amount of rials could be added to the note issue. If the note issue after devaluation were kept the same, a substantial amount of foreign exchange could be released from the Issue Department's cover reserves.

Since this question of the devaluation of the rial does not come within the scope of our responsibility, and since we understand that it has been under study by an expert engaged by the Iranian Government, we shall not express any opinion as to its desirability.

Decrease in Note Cover Reserve Requirement

This, like the question of devaluation of the rial, we understand has been under study by others, and we are therefore not expressing any opinion as to its desirability.

Government Employee Transfer To Plan Work

Over some considerable period of time there has grown up in Iran a Government employment policy which has loaded Government offices, Government companies, and private industry with a substantial surplus of employees. So far as can be seen, they perform no useful function as producers, and discharge only the most superficial and unnecessary duties. We have no means of estimating what this surplus amounts to, but we understand that a commission appointed by the Prime Minister is studying the possibilities of its reduction. Practically speaking, the present policy constitutes a system of unemployment benefits. It is manifestly unsatisfactory, not only from the viewpoint of Government efficiency, but also because it leaves such surplus employees without any feeling of personal pride in their work and of responsibility for producing something real in the way of goods and services. It likewise must reduce the morale of the producing employees to see these supernumeraries idling through the days.

The diversion of a substantial part of this surplus of employees from their present status to that of working and producing for the Plan would constitute a large financial contribution to the rial cost of the Plan. Here, then, is the possibility of putting a large staff of employees to work on constructive projects without adding to the Government expenses except insofar as payroll adjustments may be needed. One of the first tasks of the Plan Organization should be an analysis of the numbers, the locations, and the skills both actual and potential of these superfluous employees. We recognize that it is difficult to force labor to move from one job to another or from one locality to another, but feel that every effort must be made to transfer these superfluous workers into the productive work of the Plan. Without such transfer, we doubt whether the Plan can develop its potentialities because of the unnecessary additional payroll cost to the Government, the consequent

drain on the rial supply, and also because unless these idle hands are mobilized, there may well be a shortage of labor available to the Plan.

Diversion of Ministry Expenditures

It is important that in view of the limited amount of rials available for the prosecution of the Plan, there should be no duplication of expenditures for what essentially are improvements contemplated by the Plan. With this in mind, a careful comparative study should be made of current ministry expenditures with those proposed in the Plan program. By eliminating any duplications and concentrating authority for and direction of expenditures in the Plan Organization, additional rials will be mobilized for the program. We are unable to estimate these quantitatively, but we are convinced that much can be done on the basis of thorough and careful studies by the Plan Organization with the co-operation of the Ministries.

Sale of Government Properties

The Iranian Government owns outright many companies doing various manufacturing and commercial operations within Iran. It also owns substantial amounts of real property, such as public lands and buildings. We shall consider first the potential contribution of Government-owned companies to the rial budget of the Plan.

A potential source of rials for carrying out of the Plan would be the sale to the public of the state-owned factories now operated by the Industrial Bank. This cannot be carried out immediately for various reasons. The factories are at present not well managed, and being operated as state institutions with political influence exercised on their management policies, including the employment of unnecessary employees, they are not making profits for the state. It is difficult to form any accurate picture of their profit-making possibilities from their present accounting practices and reports. The problem of reorganizing these factories so that they will be profitable to their owners has been thoroughly studied by us. At this time it is improbable that they could be sold to the public at anything like their potential value because of their condition. It is safe to say, therefore, that there is little immediate prospect of realizing a substantial amount of rials for the Plan program from the sale of these capital assets. In spite of the difficulties inherent in management problems of Government-owned businesses, it should be possible to improve the operations of these Government-owned companies. After this has been done, there may be a substantial possibility of selling them to the public. For the present, however, there is small likelihood of either corporate profits or capital sales of these companies contributing to the financing of the Plan. About all that can be hoped for currently is that better management will reduce their losses and thus perhaps release some rials for Plan expenditures.

The most important immediate contribution which the Government companies can make to the success of the Plan is by increasing their volume of production through greater efficiency. This could provide more consumer goods for sale to the public and would help to counteract the inflationary effect of increased rial expenditures by the Government.

Regarding the potential availability of rials from the sale of Government real estate, this will have to be based on careful studies. At this point it should be remarked that all current proposals for construction, rebuilding, or improvement of Government buildings

should be examined carefully and their execution judged strictly on the basis of whether they are desirable at this time with the Seven Year Plan about to begin.

We understand that at the present time there is substantial speculation in real estate currently being carried on in Iran. It is impossible to estimate the volume of this, but with the substantial growth of bank deposits which has taken place over the last few years, it seems probable that considerable amounts of these deposits may be turning over currently in real estate and commodity speculation. We are not in a position to estimate the effect of the sale of Government-owned real estate on this speculative market. We recommend that a careful inventory of such Government holdings be made as a preliminary to the determination of a wise policy.

Taxation and Tax Collection

Sound Government fiscal policy in any nation requires that where the state must make substantial withdrawals of goods and services from the nation's supply, thus releasing purchasing power to the public, a substantial part of this released purchasing power should be recaptured by taxation to restrain inflation. The problem of taxation and tax collection in Iran is treated in the legal section of this report and will not be discussed here, except insofar as is necessary for the appraisal of the current potential contribution of taxes to the financing of the Seven Year Plan. As regards excise taxes, the welfare of the Iranian people would probably be improved by the removal or at least reduction of the retail kerosene tax, for instance. Its one desirable feature is ease of collection, and this does not counter-balance its many undesirable effects. It is common knowledge that direct taxes are currently evaded and avoided by those who under the present law should be taxpayers. If tax collections are going to contribute their proper share to the financing of the Plan, there must be a complete revision of the tax collection system and taxation principles must be adopted which fit the conditions and the psychology of Iran.

The Use of Credit

This is an extremely important aspect of the problem of Plan financing. To appreciate it, one must understand the elements of the banking and the credit structures as they exist at present in Iran.

The state-owned and privately owned banking institutions of Iran are listed below. Not all of the state-owned institutions are banking institutions in the strict sense of the word. The Industrial and Mining Bank is an example of this. The State Insurance Company under its charter is allowed to take deposits and hence is included in this comprehensive list.

State-owned Banking Institutions

- Bank Melli Iran
- The Industrial and Mining Bank of Iran
- The Mortgage Bank of Iran
- The Agricultural and Industrial Bank of Iran
- The Insurance Company

Privately Owned Banking Institutions

- British Bank of Iran and the Middle East
- Russo-Iranian Bank
- Army Co-operative Bank

Bank Melli Iran

This is the national bank of Iran. It is the Government bank, the bank of issue, a banker's bank, and a bank doing business with the public. With the exception of the relatively small business done by the private banks, it has a practical monopoly of the general banking business of Iran. It has 189 branches and agencies throughout the country, and its influence in the Iranian banking field is dominant. Its operations are subdivided into an Issue Department, which is responsible for the maintenance of the reserve of gold, foreign exchange, and crown jewel value against the note issue, and a Banking Department which does a general banking business with the Government, with banks at home and abroad, and with the public. It accepts savings deposits from the public in addition to its other functions, controls the foreign exchange market in Iran, and makes loans under certain restricted conditions. Its lending powers to the public are limited by statute to guaranteed, collateraled, or two-name loans.

The Industrial and Mining Bank of Iran

This bank (Bank Sanaati va Maadani Iran) was established about two years ago in order to take over the control and administration of Government industrial enterprises on behalf of the Government. Its capital is Rls. 2,500,000,000 and the Government is the only shareholder. It provides capital and other financial facilities for industrial development and it may carry out any normal banking activities. It has five or six branches in Iran. No balance sheet has been published. It is really a holding and operating company for Government-owned manufacturing companies, with charter powers to accept deposits.

The Mortgage Bank of Iran

The above bank (Bank Rahni Iran) was established in 1317 with a capital of Rls. 200,000,000 in order to carry on a general mortgage business. The greater part of its funds are tied up in long-term loans and its resources and revenues are now insufficient to provide anything but limited facilities for small short-term loans. It has power to conclude banking transactions and accept deposits. The total of its deposits and creditors as of 29 Esfand 1326 was Rls. 82,000,000, while the total of its loans and advances at the same date amounted to Rls. 326,000,000. The bank has nine branches in the main cities of Iran.

Although this bank was set up to do a general business with the public by lending against mortgages, it has long since put out its capital in the form of loans, and since the payoffs provide but small facilities for new loans, it can hardly be said to discharge the function to new borrowers for which it was set up.

The Agricultural and Industrial Bank of Iran

This bank (Bank Keshavarzi Va Pisheh Va Honar), which was set up in 1312, has a capital of Rls. 300,000,000 and has as its main objective the provision of financial facilities for agriculture generally. It has some 31 branches in Iran. It may, as its name implies, also participate in industrial activity, and it has powers to accept deposits. The total of the bank's fixed and sight deposits at 29 Esfand 1326 was Rls. 261,000,000, while the total of loans and advances at the same date was Rls. 515,000,000.

The Insurance Company

This Government-owned insurance company does a large part of the insurance business in Iran, although foreign companies are allowed to operate under certain restrictions. They are required to place part of their reinsurance with the Government company.

The Insurance Company has charter powers to accept deposits, and the amount of such deposits on 29 Esfand 1326 was Rls. 2,057,483. It carries its reserves as deposits with the Bank Melli Iran.

British Bank of Iran and the Middle East

This foreign-owned institution, until recently known as the Imperial Bank of Iran, was formerly the bank of issue for Iran until this power was taken over by the Bank Melli Iran on 29 Esfand 1319. Its concession expired on 10 Bahman 1327. On that date a Government decree required foreign banks to keep 55 per cent of their deposits with the Bank Melli Iran and likewise set maximum limits on the amount of deposits which such banks could hold. Under this decree the operations of the bank are substantially restricted. It makes no separate public statements of its Iranian operations as distinct from its branches in Iraq, Bahrein, Dubai, Kuwait, Syria, and Lebanon. Deposits as of 29 Esfand 1327 were Rls. 1,327,700,000 and its advances Rls. 468,200,000.

Russo-Iranian Bank

The business of this bank (Bank Russe va Iran) is almost entirely limited to the financing of Irano-Russian commerce, which at present is at a very low ebb. The last available balance sheet as at 11 Dey 1323 shows a paid up capital of Rls. 8,125,000 with an amount of Rls. 185,080,000 for deposits and creditors. Loans and advances at the same date totaled Rls. 5,500,000.

Army Co-operative Bank

This bank (Bank Taavani Sepah) was established in 1304 for the purpose of providing financial assistance to officers in the armed forces. Its capital is formed out of the officers' contributions to the provident fund. It may carry out normal banking transactions and receives money on deposit. The total of the deposits held as at 29 Esfand 1325, the last date for which figures have been made available, was Rls. 185,000,000, while loans and advances at the same date amounted to Rls. 235,000,000. The bank has 11 branches in the main cities of Iran.

Summary of Credit Sources

It is evident from this brief review that these institutions can extend credit to various classes of prospective borrowers only to a limited degree. The largest and most powerful of all of these, the Bank Melli Iran, is restricted by its statutes to certain types of loans of high quality. Borrowers whose credit standing does not give them access to Bank Melli facilities are forced to borrow where they can, which usually means a "bazaar" loan. Since Iran has an usury law which limits legal interest charges to 12 per cent, bazaar loans take the form of the discount of an "I.O.U." with no interest stated but with an effective rate which reputedly may go up to 24 or 36 per cent per annum, or even higher.

We believe that the provision of banking and credit facilities additional to those now available to the people of Iran should be based on careful studies of the existing institutions, leading to revision and amplification of their charter powers where necessary. We think that this should be done before consideration is given to organizing additional banking institutions.

Iran's Supply of Capital

Article 6 of the Plan Act authorizes the Government "to obtain credits from local non-governmental institutions or from foreign commercial institutions for the purpose of completing the financial requirements of the Plan."

It is impossible to estimate Iran's supply of capital, especially liquid capital. The present status of Iran reflects the conditions which obtain generally in underdeveloped countries, and also the psychology of the East. The risks of enterprises are great, and the interest rates which are demanded as a return on capital investment—large or small—are correspondingly high. There is no semblance of an organized capital market, to which long-term or short-term borrowers can resort, and where competition among those who control capital and wish to put it to work tends to bring interest rates down. The individual has all too often been subjected to the vagaries of Government servants, as well as to the competition of other individuals, who are unscrupulous and greedy. As a result, individual capital holdings have tended to take the form of hoarded treasure, of real estate investment both permanent and speculative, and of commodity speculation. Investment, as the West knows it, in shares of stock or industrial and Government bonds is but little known. To tap these widely distributed capital holdings and pipe them into larger scale enterprises is going to be a slow and difficult job, but one that should be begun. Currently the prospective investor will compare his high interest return on individual, high risk, and speculative ventures with those available in sounder, larger scale enterprises to be financed with securities in the Western pattern, and will tend to continue with the type to which he and his ancestors have been accustomed. But the start should be made; in fact, it must be made if the country is to progress toward a higher living standard.

Summary of Availability of Rials

From the foregoing analysis of rial availability for the use of the Plan, certain things stand out plainly. Most important of these is that every effort must be made to transfer surplus employees out of their present posts in Government companies and ministries and into the work of the Plan, and to reduction of Government spending. Rials must be made available to the Plan by squeezing them out of the budgets. This is not an easy process. Governments never like to reduce expenses. However, the rials made available to the Plan from these two sources can be spent without inflationary danger to the economy because they will be diversions of present expenditures and not additional disbursements.

We must now consider the possible supply of rials which can be made available to the Government in the form of additional expendable cash balances. We have mentioned as sources of such additional balances, tax income, the sale of Government properties to the public, income from the profits of Government-owned companies, Government borrowing, and certain modifications in the present status of the note issue. We have expressed our opinion on each of these, except for the last which we do not consider as coming within the scope of our inquiry. We wish to emphasize again that the creation of rial purchasing power by the Government without corresponding subtraction of purchasing power from the public can lead to dangerous inflationary conditions. Better tax collection and sale of Government properties wisely handled could eventually produce substantial cash resources to spend on this Plan. We should like to see Government rial borrowings confined to the public, though we recognize that to be successful such offerings of bonds must be planned in such a way as to have effective appeal to private capitalists. We

think that borrowing from the Bank Melli should be avoided in view of the inflationary influence which such borrowings would be almost sure to have. The Government is already in debt to the Bank Melli for nearly Rls. 4,000,000,000. To extend this borrowing from the Bank Melli in any important amount, even though authorized under the enabling act, would be definitely inflationary for the reasons already made plain.

It does not appear that the Government can count on any substantial loans from individual capitalists for financing the Seven Year Plan for a considerable time to come. Perhaps individual investment in Government bonds might be stimulated by some such device as lottery bonds, such as used in some European countries, in which the bond holder in addition to his interest return stands an eventual chance of drawing a substantial prize if his bond number happens to be drawn in a lottery. Iran has a functioning lottery at this moment, run by the Government for the benefit of charitable work. The lottery feature has been likewise used in the stimulation of Bank Melli savings deposits, where the individual depositor may get a so-called "bonus" at the year end if the number of his account is fortunately drawn. These two lotteries have accustomed the people to the principle of chance in financial affairs.

FOREIGN EXCHANGE EXPENDITURES

The expenditures made with foreign exchange will consist of those for the ordinary imports of the Iranian economy and of those specifically made for the account of the Plan. Another category of foreign expenditures will be involved in the form of debt service and amortization if Iran enters into any foreign loan arrangement in connection with the financing of the Plan and thereby incurs the obligation of such payments in foreign currencies. Foreign exchange expenditures for account of the Plan should be made only in such volume as can be handled at the ports, transported and then installed without involving rial expenditures by the Government at an inflationary rate.

EXPENDITURES MADE WITH RIALS

The internal expenditures of rials for labor, for construction, and for the transportation and installation of machinery and equipment under the Plan will release purchasing power to the public, which should be absorbed by an increase in the available supply of consumer goods if inflation is to be prevented. It therefore will be of the greatest importance to increase the domestic production of manufactured goods (using existing facilities to the maximum) and of agricultural products as rapidly as possible, which are major objectives of the Plan.

It is important again to emphasize the fundamental and far-reaching effect of rial expenditures made in Iran by the Government. Repeating what has been said before, insofar as rial purchasing power has not been previously subtracted from the public's supply, these expenditures will subtract goods and services from the domestic market and put additional rials in circulation. This is the process of inflation, and it must be restrained by additional domestic production, both industrial and agricultural, to absorb the addition rials by diverting so far as possible some of the present Governmental expenditures into the constructive effort of the Plan, and, most important of all, by putting the present surplus of unnecessary Government employees in the Ministry activities and Government-owned corporations into the Plan Organization where they can and will work. Except for salary or wage increases this last should add nothing to the Government rial expenditures

since the employees are already being paid. Payroll will probably be the most important item of rial Plan expense. In the field of Plan administration, the principle of diversion also applies. The Plan executives should so far as possible be transferred from present posts in the Government into the Plan Organization.

If these recommendations are carried out, it will ease the rial requirements for material and labor expenditures in Iran. The specific material items to be bought domestically will be developed from the Plan program and the quantities to be bought limited by their prospective influence on the price structure. It is quite possible that consideration will have to be given to limiting the public's consumption of scarce items. In any case the Government's program must be administered so that the Ministries are not competing with the Plan in the material and labor markets.

THE EFFECT OF FOREIGN EXCHANGE EXPENDITURES

Expenditures of foreign exchange made by Iranian importers for what might be called the "normal" requirements of the Iranian economy must be examined closely from the viewpoint of whether or not they contribute to the general welfare of the Iranian people rather than to the desires of the few. It will be a constant temptation to allow the importation of luxury items which can be sold profitably, particularly in a city like Tehran. But there are many items not in the luxury class as ordinarily interpreted which might well be restricted. In such cases sound judgment must be exercised continuously by the authorities.

We have touched previously on the effect of the purchases abroad of consumer goods, such as food and wearing apparel, on the domestic economy. Bought directly or indirectly by the Government with its foreign exchange, they would reduce the amount available for Plan purchases abroad, but imported into the country and sold into distribution channels by the Government, they would tend to hold down domestic prices, unless the state permitted them to fall into the hands of speculators who would try to profiteer with this added supply.

Foreign expenditures for materials necessary for the Plan will not produce domestic inflation. However, as has been repeatedly emphasized, the amounts and the rates of expenditures must be carefully proportioned to the rate at which rial expenditures for their transport and installation can be safely made.

THE EFFECT OF RIAL EXPENDITURES

The effect of rial expenditures for the Plan has been constantly emphasized so far in this report, and all that is necessary here is to recapitulate it. So far as they are diverted to the Plan from present types of expenditures, they will not have an inflationary effect. If they are made in addition to the present level of Government budgets without any increase in domestic agricultural and industrial production to offset the purchasing power released by them, they will be inflationary. If the Government should take Rls. 100,000 out of its bank balances and use it to buy merchandise for the Plan out of the present floating supply normally in balance, as shown by a stationary price level, there would be 100,000 more rials in circulation and Rls. 100,000 less in value of merchandise in the supply available to the public. The price level is not generally slow to react to this

type of influence if the subtractions of merchandise and services and the corresponding increases of money put in circulation reach any substantial amounts. The causes of inflation are simple, but the effects are profound and complex.

CONTROL OF EXPENDITURES IN CARRYING OUT THE PLAN

The necessity for controlling rial expenditures in carrying out the Plan has repeatedly been brought out. Iran has an unbalanced economy in that it has enormous natural resources in its petroleum reserves, which have been partly developed by AIOC and for the most part exported and sold in foreign currencies. It has a fishing concession exploited by the USSR which appears to contribute little if anything to its welfare. Its normal exports are not large. Its over-all standard of living is low, and its agricultural and industrial methods generally border on the primitive. Were it not for its petroleum resources, the problem of improving the general standard of living would be very different from the actual one, and, of course, a much slower process. Iran's problems of raising its domestic standard of living by the use of a great exportable natural resource is one that has been tackled by certain other nations in similar situations. The lesson which Iran can draw from such cases confirms what has been so often repeated in this report, namely, that the rate of Government expenditures in the domestic currency must be handled and controlled so that their effect on the price level is minimized. In cases where this has not been done, the availability to the Government of large purchasing power in foreign currencies stemming from royalties and profitable sales abroad of the domestic natural resource has been a temptation to the Government to release this foreign purchasing power for the importation of all sorts of merchandise from abroad, both capital goods and consumer goods. The development of the natural resource within the domestic economy has required large amounts of domestic currency for payrolls and other local purchases by the producers and processors of the natural resource. The economic effects on the domestic situation tend to be to disorganize the normal mechanism of domestic production and to lift the domestic price level substantially. That part of the population employed in the development and processing of the natural resource may, and probably does, receive higher wages and hence undepreciated purchasing power to command the means of subsistence, but the rest of the population which is engaged in the normal activities of the nation does not proportionately receive higher wages and hence is subjected to the serious pressure of decreased real wages. Iran is approaching a similar situation, and hence the necessity of facing these facts squarely and aggressively.

Two major facts must be faced in the case of Iran: the operation of AIOC requires substantial expenditures of rials for payrolls and domestic purchases of material. These have been provided by the conversion of sterling into rials in increasing annual amounts. A substantial proportion of royalty sterling has also been converted into rials. The amount of rial notes outstanding has remained more or less the same over this period of increasing sterling conversion, and there has been but little change in the volume of notes in the hands of the public. However, there has been a considerable increase in bank deposits over the same period. These constitute an increase in the circulating medium of Iran in addition to the notes outstanding, which, even in a country where checks are not yet widely used for the settlement of accounts, is a strong inflationary force. If the rials received from sterling sales are neutralized by the sale of this sterling to importers paid for out of the importer's rial balances, the tendency to inflate is also held in check.

The second fact that Iran must face is that Government rial expenditures for account of the Plan constitute an additional inflationary influence. Unless this is mitigated

by the transfer of employees from presently unproductive Government posts to productive work on the Plan, and by the diversion of ministerial expenditures competitive or additional to the Plan into the work and administration of the Plan, there is a serious danger of inflation. The general cost of living will rise, and the estimates on which the program of the Plan are based will prove too low.

EFFECT OF EXPENDITURES ON ECONOMIC STABILITY

Enough has been said in the preceding sections of this report to make it clear how strongly we feel that the Plan cannot be carried out successfully unless the rate of rial expenditures is definitely controlled. These controls must be extended so far as is necessary to insure the economic stability of Iran. Since the whole purpose of the Plan is to improve the standard of living conditions of the people of the country, it would be nothing less than foolish to carry out the Plan proposals and end up with the distress and political disturbance which always accompany severe inflation. The best measure of economic stability lies in the price level. We appreciate that the present Iranian statistical organization is not yet perfected to the point where the measure is an exact one, and, of course, in addition to the other complications of measurement, there is the problem of variation in the velocity of circulation of the purchasing media. There will be political pressures to be resisted which will take a high order of firmness to withstand. The unqualified support of the Government will be required if the controlling authority is to be effective. The control must be an empirical one, in the sense that no one is wise enough to predict in advance what quantitative effect on the price level a certain volume of rial expenditures by the Plan Board will have. For that reason the work should start slowly, even though the temptation will be to begin with large expenditures for their political effect. Herein lies the heaviest responsibility of the Plan Administrator. He will want to show results and without delay, and yet be must know and keep constantly in mind that a rising price trend, if continued, can wreck the Plan and endanger the politieal situation. No rules can be laid down at this time for doing the job of regulation.

EXHIBITS

HIS IMPERIAL MAJES

COUNCIL OF MINISTERS | PRIME MINISTER | MAJLESS

BOARD OF CONTROL

MANAGING DIRECTOR

STAFF ASSISTANTS

STAFF ASSISTANTS

CONSULTANTS

DIRECTOR OF ADMINISTRATION AND FINANCE

DIRECTOR OF TECHNICAL SERVICES

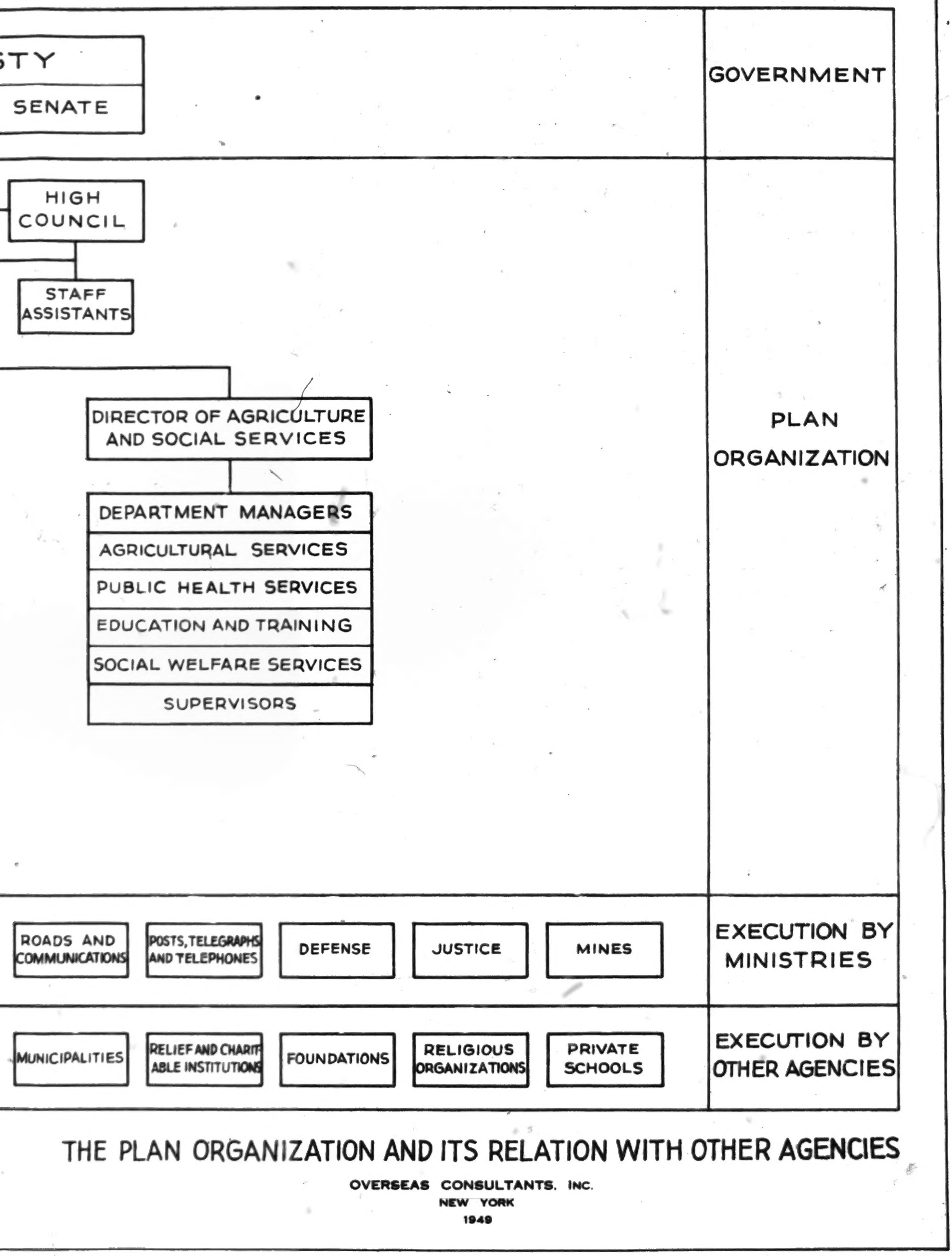
DEPARTMENT MANAGERS
ADMINISTRATION
FINANCE
PERSONNEL
LEGAL AFFAIRS
ECONOMIC AND STATISTICAL SERVICES
REVIEW AND COORDINATION
COMPANY AND BUSINESS SERVICES
SUPERVISORS

DEPARTMENT MANAGERS
PURCHASING, STORES AND SALVAGE
GENERAL ENGINEERING
MANUFACTURING
MINERAL RESOURCES
ELECTRIC POWER
WATER DEVELOPMENT
TRANSPORTATION
TELECOMMUNICATIONS
SUPERVISORS

FINANCE | NATIONAL ECONOMY | LABOR | INTERIOR | AGRICULTURE | EDUCATION | PUBLIC HEALTH

LOCAL CONTRACTORS | FOREIGN CONTRACTORS | COOPERATIVES | GOVERNMENT COMPANIES | PRIVATE COMPANIES | JOINT STOCK COMPANIES | FOREIGN COMPANIES

EXHIBIT N-1



THE PLAN ORGANIZATION AND ITS RELATION WITH OTHER AGENCIES

OVERSEAS CONSULTANTS, INC.
NEW YORK
1949

Exhibit P-1

THE OUTLINE OF A TYPICAL SUMMARY OF CENSUS STATISTICS

Marital Status				Literacy				Disabilities				Age Group	Religion
1	2	3	4	1	2	3	4	1	2	3	4		
												0-4	
												5-9	
												10-19	
												20-29	
												30-39	Moslem
												40-49	
												50-59	
												60 or More	
												Total	
												0-4	
												5-9	
												10-19	
												20-29	
												30-39	Christian
												40-49	
												50-59	
												60 or More	
												Total	
												0-4	
												5-9	
												10-19	
												20-29	
												30-39	Jew
												40-49	
												50-59	
												60 or More	
												Total	
												0-4	
												5-9	
												10-19	
												20-29	
												30-39	Other
												40-49	
												50-59	
												60 or More	
												Total	

Exhibit P-2

THE OUTLINE OF A CENSUS ENUMERATOR'S FORM

(010748. 4293) A

.....

.....

COMMON INFORMATION

.....

.....

CENSUS ONLY INFORMATION

.....

.....

CENSUS COPY

(010748. 4293) B

.....

.....

COMMON INFORMATION

.....

.....

(Office Stamp)

TEHRAN COPY

(010748. 4293) C

.....

.....

COMMON INFORMATION

.....

.....

(Office Stamp)

OSTAN COPY

NOTE: On reverse side of B and C are thumbprint and photograph and additional information for registration only.

THE OUTLINE OF A
MINISTRY OF HEALTH—MONTHLY RETURN CARD

(.....)		(.....)		Scarlet Fever		Diphtheria		Trachoma		Smallpox		Week Number
C	D	C	D	C	D	C	D	C	D	C	D	
												1
												2
												3
												4
												5
												6
												7
												8
												9
												10
												11
												12
												13
												Total

Epidemic Danger

Receipt—Weekly

Receipt—Monthly

Numbers: Ord. | Sear. | Typ. | Serial

Location

C = CASES; D = DEATHS.

(Front)

Note: The back of this card will be ruled for addition of selected records by the rendering units as well as additional details about the unit which may subsequently seem desirable to the Ministry.

THE OUTLINE OF A PERMANENT EMPLOYER'S RECORD CARD

(This space for serial number of factory)

PERMANENT EMPLOYMENT RECORD, AS AT.....(DATE)

Name of Factory: .....

Address: .....

Nature of Work: .....

Name of Owner: .....

Total Annual Production: .....

Nature of Product: .....

Units in Which Expressed: .....
(Kilos, boxes of ten, or other)

Quantity: .....

Total hp. of Motors: .....

LENGTH OF EMPLOYMENT					
TOTAL	AGE—UNDER 18 YR.		18 YR. OR OVER		PERSONS EMPLOYED BY THE FACTORY
	FEMALE	MALE	FEMALE	MALE	
					LESS THAN 1 YR.
					LESS THAN 2 YRS.
					BETWEEN 2 AND 3 YRS.
					OVER 5 YRS.
					TOTAL

1

(Side Number One—Front Cover)

STAFF AS AT ..... MALE CITIZENS ONLY

MANAGERIAL STAFF	TECHNICAL SPECIALISTS	CLERICAL	TOTAL WORKMEN	HEAD ARTISANS	ARTISANS	WORKMEN GRADE 1	WORKMEN GRADE 2	WORKMEN GRADE 3	WORKMEN UNSKILLED	DETAILS REQUIRED	AGE GROUP
										NUMBER	
			X							MAXIMUM DAILY WAGE	UNDER 13
			X							MINIMUM DAILY WAGE	
										YEARLY WAGES PAID	
										NUMBER	
			X							MAXIMUM DAILY WAGE	13-14 YRS.
			X							MINIMUM DAILY WAGE	
										YEARLY WAGES PAID	
										NUMBER	
			X							MAXIMUM DAILY WAGE	15 YRS.
			X							MINIMUM DAILY WAGE	
										YEARLY WAGES PAID	
										NUMBER	
			X							MAXIMUM DAILY WAGE	16 YRS.
			X							MINIMUM DAILY WAGE	
										YEARLY WAGES PAID	
										NUMBER	
			X							MAXIMUM DAILY WAGE	17 YRS.
			X							MINIMUM DAILY WAGE	
										YEARLY WAGES PAID	
										NUMBER	
			X							MAXIMUM DAILY WAGE	18 YRS. AND OVER
			X							MINIMUM DAILY WAGE	
										YEARLY WAGES PAID	
										TOTAL NUMBERS	ALL AGES
										TOTAL YEARLY WAGES PAID	

(Side Number Two—Inside of Front Cover)

FEMALE CITIZENS ONLY

Managerial Staff	Technical Specialists	Clerical	Total Workmen	Head Artisans	Artisans	Workmen Grade 1	Workmen Grade 2	Workmen Grade 3	Workmen Unskilled	Details Required	Age Group
										Number Maximum Daily Wage Minimum Daily Wage Yearly Wages Paid	Under 13
										Number Maximum Daily Wage Minimum Daily Wage Yearly Wages Paid	13-14 Yrs.
										Number Maximum Daily Wage Minimum Daily Wage Yearly Wages Paid	15 Yrs.
										Number Maximum Daily Wage Minimum Daily Wage Yearly Wages Paid	16 Yrs.
										Number Maximum Daily Wage Minimum Daily Wage Yearly Wages Paid	17 Yrs.
										Number Maximum Daily Wage Minimum Daily Wage Yearly Wages Paid	18 Yrs. and Over
										Total Numbers Total Yearly Wages Paid	All Ages

(Side Number Two—Inside of Back Cover)

FOREIGN CITIZENS ONLY

Managerial Staff	Technical Specialists	Clerical	Total Workmen	Head Artisans	Artisans	Workmen Grade 1	Workmen Grade 2	Workmen Grade 3	Workmen Unskilled	Details Required	Age Group
										Number Maximum Daily Wage Minimum Daily Wage Yearly Wages Paid	Under 13
										Number Maximum Daily Wage Minimum Daily Wage Yearly Wages Paid	13-14 Yrs.
										Number Maximum Daily Wage Minimum Daily Wage Yearly Wages Paid	15 Yrs.
										Number Maximum Daily Wage Minimum Daily Wage Yearly Wages Paid	16 Yrs.
										Number Maximum Daily Wage Minimum Daily Wage Yearly Wages Paid	17 Yrs.
										Number Maximum Daily Wage Minimum Daily Wage Yearly Wages Paid	18 Yrs. and Over
										Total Numbers Total Yearly Wages Paid	All Ages

4

(Side Number One—Back Cover)

THE OUTLINE OF A QUARTERLY RETURN FORM FOR TRADES, WAGES AND WELFARE

(This space for serial number of factory)

I

TRADES, WAGES, AND WELFARE RETURN

FOR THE QUARTER ENDING

(.....)

NAME OF FACTORY: .....

ADDRESS: .....

NATURE OF WORK: .....

.....

II

QUESTIONNAIRE

PLEASE FILL OUT THE FOLLOWING TABLE FOR WORKMEN UNDER 18 YEARS OF AGE WHO ARE OF SKILLED GRADE.

MINIMUM WAGE	MAXIMUM WAGE	NUMBER	TRADE	GRADE

III

PLEASE ANSWER THE FOLLOWING QUESTIONS IN THE SPACE PROVIDED:

1. Are the workers given allowances in kind (for example, food and clothes) in addition to their wages? .....
   If so, state what type of benefit and estimate the monthly value of such allowances. .....
   .....

2. Is the worker paid wages when sick in addition to the normal compensation for industrial injury?
   .....

3. What are the normal hours worked by the workers? .....
   What is the average overtime per worker in a month? .....

4. Name each type of deduction made from workers' wages: .....
   .....
   What is the amount? .....
   What percentage of the worker's wages does this represent? .....
   Is this stopped from the pay packet or collected from the worker? .....

QUESTIONNAIRE—CONTINUED

5. Are any advantages given to married workers? If so, state. .....

6. What is the total number of literate workers in the factory? _____
   What action is taken about illiterate workers? _____

7. What is the average number throughout the quarter of workers absent each day from sickness? _____

8. How many workers are absent from the factory owing to sickness on the last day of the quarter? _____
   How many of these have been absent one day? _____
   How many two days? _____
   How many three days? _____
   How many four days? _____
   How many five days? _____
   How many six or seven days? _____
   How many over one week but under one month? _____
   How many over one month? _____

9. Is there a free Government or Municipal hospital in the town? _____
   Are workers admitted when necessary? _____

10. Is there a factory doctor? _____
    Is any charge made to the workers for his services? _____
    Is there a clinic or dispensary? _____

11. Total number of workers who have died during the quarter from:
    a. Accident _____
    b. Other causes _____

12. Total number of workers who have retired from their employment during the quarter because of:
    a. Old age _____
    b. Ill health or infirmity _____
    c. Other causes _____

13. What is the daily average number of workers absent over the quarter for reasons other than sickness? _____

14. What is the number of married workers:
    a. Without children _____
    b. With one child under 15 years of age _____
    c. With two children under 15 years of age _____
    d. With three children under 15 years of age _____
    e. With four children under 15 years of age _____
    f. With five children under 15 years of age _____
    g. With more than five children under 15 years of age _____

Workmen Under 18 Years of Age					Details Required	Trade One to Each Box	Male or Female
Total	17	16 to 15	14 to 13	Under 13			
					Number Daily Maximum Wage Daily Minimum Wage Total Wages— Last Pay Day		
					Number Daily Maximum Wage Daily Minimum Wage Total Wages— Last Pay Day		
					Number Daily Maximum Wage Daily Minimum Wage Total Wages— Last Pay Day		
					Number Daily Maximum Wage Daily Minimum Wage Total Wages— Last Pay Day		
					Number Daily Maximum Wage Daily Minimum Wage Total Wages— Last Pay Day		
					Number Daily Maximum Wage Daily Minimum Wage Total Wages— Last Pay Day		

3. Mark one male trade in each box. Fill in number and wage entries. Strike totals for all male trades. Repeat for female trades. Strike totals for all (male plus female) trades.

4. Show foreign citizens in red ink.

Total All Ages and Grades	Workmen 18 Years of Age and Older						
	Total	Head Artisans	Artisans	Workmen Grade 1	Workmen Grade 2	Workmen Grade 3	Workmen Unskilled

RECOMMENDED ALLOCATION OF PLAN FUNDS FOR STATISTICAL ORGANIZATION

In Thousands of Rials

	1328—Second Half			1329			Remaining 5½ Years			Total		
	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total	Domestic	Foreign Exchange	Total
Census of Population (3 Years)												
Machine Rental	—	850	850	—	1,750	1,750	—	2,600	2,600	—	5,200	5,200
Machine Cards	—	270	270	—	540	540	—	815	815	—	1,625	1,625
Machine Supervisor	100	60	160	150	130	280	250	200	450	500	390	890
Census Specialist	200	130	330	300	260	560	500	390	890	1,000	780	1,780
Staff	1,800	—	1,800	3,600	—	3,600	5,400	—	5,400	10,800	—	10,800
Contingencies	800	—	800	1,600	—	1,600	2,305	—	2,305	4,705	—	4,705
Total	2,900	1,310	4,210	5,650	2,680	8,330	8,455	4,005	12,460	17,005	7,995	25,000
Agricultural Section (7 Years)												
Foreign Advisers	125	130	255	250	260	510	1,375	1,430	2,805	1,750	1,820	3,570
Crop Estimation	250	—	250	500	—	500	2,750	—	2,750	3,500	—	3,500
Organization	1,250	—	1,250	3,250	—	3,250	14,000	—	14,000	18,500	—	18,500
Field Expense	—	—	—	—	—	—	16,000	—	16,000	16,000	—	16,000
Census	75	—	75	150	—	150	838	—	838	1,063	—	1,063
Contingencies												
Total	1,700	130	1,830	4,150	260	4,410	34,963	1,430	36,393	40,813	1,820	42,633
Central Statistical Bureau (7 Years)												
Machinery Rental	—	160	160	—	320	320	—	2,120	2,120	—	2,600	2,600
Permanent Organization												
Foreign Advisers (2)	320	200	520	640	400	1,040	3,040	2,130	5,170	4,000	2,730	6,730
Iranian				1,000	—	1,000	5,500	—	5,500	7,000	—	7,000
Directors & Inspection Staff	500	—	500									
Machine Pool Staff (17)	500	—	500	1,000	—	1,000	5,640	—	5,640	7,140	—	7,140
Administration Section	300	—	300	600	—	600	3,300	—	3,300	4,200	—	4,200
Statscentre Staff	350	—	350	700	—	700	3,950	—	3,950	5,000	—	5,000
Superintendents (6)	350	—	350	700	—	700	3,950	—	3,950	5,000	—	5,000
Clerical (14)	430	—	430	860	—	860	4,710	—	4,710	6,000	—	6,000
Temporary Organization				250	200	450	125	90	215	500	390	890
Foreign Adviser (1)	125	100	225							500	—	500
Iranian	125	—	125	250	—	250	125	—	125			
Cards	—	325	325	—	325	325	—	1,625	1,625	—	2,275	2,275
Other Foreign Equipment	—	150	150	—	175	175	—	—	—	—	325	325
Other Office Expenses	1,000	—	1,000	1,000	—	1,000	5,000	—	5,000	7,000	—	7,000
Other Administrative Expense	125	—	125	125	—	125	750	—	750	1,000	—	1,000
Total	4,125	935	5,060	7,125	1,420	8,545	36,090	5,965	42,055	47,340	8,320	55,660
Grand Total	8,725	2,375	11,100	16,925	4,360	21,285	79,508	11,400	90,908	105,158	18,135	123,293

AN OUTLINE OF NEEDED FORESTRY STATISTICS

Forest Areas

1. By ownership—State forests, communal forests, private and unreserved forest land.
2. By kind of forest—timber forests (i) hardwoods (ii) conifers. Scrub forests (i) hardwoods (ii) conifers. Bare forest land.
3. By productivity—accessible forests (i) productive (ii) cut-over. Inaccessible forests.

Silviculture

1. Area of existing plantation (i) hardwoods (ii) conifers.
2. Area of bare land newly afforested (i) hardwoods (ii) conifers.
3. Number and extent of forest nurseries: seedlings produced annually.
4. Seed. Quantity collected: Cost. Quantity imported: Cost.

Forest Protection

1. Forest fire incidence—area burnt—damage—cost of firefighting.
2. Fire control measures—work done—cost.
3. Forest grazing. Extent of grazing: (i) licensed; (ii) illicit; total areas grazed; kinds of animals.
4. Forest offenses. Analyzed by type of offense, action taken (for example Court, compounded), results (acquittals, convictions, penalties).
5. Damage by insects and other causes.

Forest Utilization

Imports—

Timber: classified as: (i) hardwoods (ii) softwoods; as sawn timber, baulks, sleepers, round (logs, poles), semi-manufactured (box shooks), plywood. Quantities in cubic meters and value. Analyzed by countries of origin.

Fuel wood and charcoal: classified by quantity in tons and by value; analyzed by countries of origin.

Exports—

Timber, fuel wood and charcoal: classified as for imports.

Tan-stuffs: classified by weight and value and analyzed by countries of destination.

Other forest produce: as for tan-stuffs.

Local production—

Timber: classified by species, by kind (for example, logs, sawn, baulks, hewn, etc.), and by source of origin (for example State, communal, or private forests). Quantities and value.

Fuel Wood: classified by species, by source of origin, by quantity and by value.

Charcoal: classified by source of origin, by quantity and by value.

Tan-stuffs: as for charcoal.

Other Forest Produce: as for charcoal.

Forest Industries

i. Sawmills—number, annual production, persons employed.
ii. Plywood factories—annual production, persons employed.
iii. Match factories—annual production, persons employed.
iv. Other industries using forest produce as the main raw material. Note: does not apply to small cottage or village industries, carpenters, and so on.

Rural Forest Industries

a. Fuel and charcoal workers.
b. Carpenters and furniture makers.
c. Tan-stuff collectors and workers.
d. Forest laborers.

This represents a kind of annual census of persons employed either full time or part time in rural forest industries.

Consumption

Timber: (imported and local)

i. Industrial purposes.
ii. Domestic use.

Timber consumption per capita.

Fuel and charcoal consumption per capita.

FOREST ADMINISTRATION

1. Forest buildings: existing, newly-built—cost; annual maintenance—cost.
2. Forest roads: existing length; new construction—cost; annual maintenance charge—cost.
3. Forest survey: area surveyed; newly surveyed—cost.
4. Forest boundaries: existing length of delimited boundary; newly demarcated—cost.
5. Forest management: Forests under working plans already in operation; new working plans completed during year—cost.
6. Forest personnel: numbers and total salary charges.
   i. Senior (university-trained) staff; by grades.
   ii. Subordinate technical staff; by grades.
   iii. Other officials (clerical, and other non-technical); by grades.
   iv. Employees on temporary establishment.
7. Annual forest expenditure: Summarized by main items and by work headings.
8. Annual forest revenue: analyzed by:—
   i. categories based on types of forest produce;
   ii. methods of collection.

THE OUTLINE OF A CENSUS OF PRODUCTION FORM

I.

Number of Cards for Gang Punching

I							TOTAL
IA	IB	IIA	IIB	III	IV	V	

PLEASE FILL IN THE FOLLOWING:

1. NAME OF PROJECT: .....

2. EXACT ADDRESS OF PROJECT: .....

3. NAME OF OWNER, OWNERS, OR RESPONSIBLE DIRECTOR: .....

4. LOCATION: .....

Ostan	Shahristan	Bakhsh
(For Office Use)	(For Office Use)	(For Office Use)

5. SERIAL NUMBER (For Office Use)

6. NATURE OF BUSINESS .....

.....

7. TYPE OF PROJECT: (MARK WITH X AGAINST PROPER HEADING)

Type	Mark Here	For Office Use
(The various types of companies will be printed here)		

8. YEAR IN WHICH ESTABLISHED 13....

IA CAPITAL AND FIXED ASSETS—(To be Shown as at Census Date)

TOTAL NOMINAL CAPITAL:	Rls. .....
CAPITAL ACTUALLY PAID IN:	.....
VALUE OF BUILDINGS AND LANDS OWNED:	.....
ANNUAL RENT OF BUILDINGS AND LANDS RENTED:	.....
ESTIMATED VALUE OF STOCKS OF RAW MATERIALS, PRODUCTS, AND SPARE PARTS ON HAND:	....

I.B.

PLEASE ENTER IN THE APPROPRIATE COLUMNS BELOW THE INDICATED DETAILS CONCERNING YOUR PRINCIPAL MACHINES.

Type of Machine	For Office Use Only	Motive Power	For Office Use Only	New (1) Second Hand (2)	Country of Manufacture	Year in Which Purchased	HP of Type	Number of Machines of This Type	Total HP for Type (for Office Use Only)	Total Original Cost of These Machines	Remarks

READ INSTRUCTIONS CAREFULLY

For Office Use Only	Total Number of Cards for Link	Gang Punch

II

PLEASE ENTER IN THE APPROPRIATE SPACES THE INDICATED PARTICULARS OF TOTAL FUEL AND POWER USED DURING THE YEAR 1328.

REMARKS (For Office Use)	VALUE IN RIALS	QUANTITY USED IN 1328	UNIT	SOURCE OF POWER
				A.
			GALLONS	KEROSENE
			TONS	CRUDE OIL
			GALLONS	GASOLINE
CARD A CHECK			GALLONS	DIESEL OIL
				B.
			KWHR	ELECTRICITY (Purchased)
			TONS	COAL
			TONS	COKE
			TONS	WOOD
CARD B CHECK			TONS	CHARCOAL

III

PLEASE SHOW HERE PARTICULARS OF ALL STAFF EMPLOYED AT DATE OF CENSUS.

REMARKS	FEMALE							
	14 YEARS OF AGE AND UNDER				OVER 14 YEARS OF AGE			
	TOTAL WAGES PAID IN LAST MONTH	NUMBER	MINIMUM WAGE	MAXIMUM WAGE	TOTAL WAGES PAID IN LAST MONTH	NUMBER	MINIMUM WAGE	MAXIMUM WAGE

MALE								TYPE OF STAFF
14 Years of Age and Under				Over 14 Years of Age				
Total Wages Paid in Last Month	Number	Minimum Wage	Maximum Wage	Total Wages Paid in Last Month	Number	Minimum Wage	Maximum Wage	
								Laborers Unskilled — Iranian
								Foreign
								Laborers Skilled — Iranian
								Foreign
								Foremen, Supervisors — Iranian
								Foreign
								Clerical Staff — Iranian
								Foreign
								Technical Specialists — Iranian
								Foreign
								Manager — Iranian
								Foreign

2

For Office Use Only

Total Number of Cards for Link Gang Punch

IV

PLEASE INSERT BELOW DETAILS OF RAW MATERIALS TAKEN IN DURING 1328 WHETHER OF LOCAL OR IMPORTED ORIGIN. READ INSTRUCTIONS CAREFULLY.

MATERIAL OF FOREIGN ORIGIN						
REMARKS	VALUE IN RIALS	QUANTITY	UNIT		KIND	
			For Office Use Only		For Office Use Only	

MATERIAL OF LOCAL ORIGIN					
VALUE IN RIALS	QUANTITY	UNIT		KIND	
		For Office Use Only		For Office Use Only	

V

PLEASE INSERT BELOW DETAILS OF PRODUCTS MADE AND SOLD IN 1328. READ INSTRUCTIONS VERY CAREFULLY.

		TOTAL EXPORTED DURING YEAR			TO BE SOLD IN IRAN DURING YEAR 1328	
For Office Use Only	COUNTRY TO WHICH SENT	VALUE IN RIALS	QUANTITY		VALUE IN RIALS	QUANTITY

Total Produced During Year 1328		Unit		Kind	
Value In Rials	Quantity	For Office Use Only		For Office Use Only	
					For Office Use Cards for Link Gang Punch

THE OUTLINE OF A TRAFFIC CENSUS FORM

Location..... Date.....

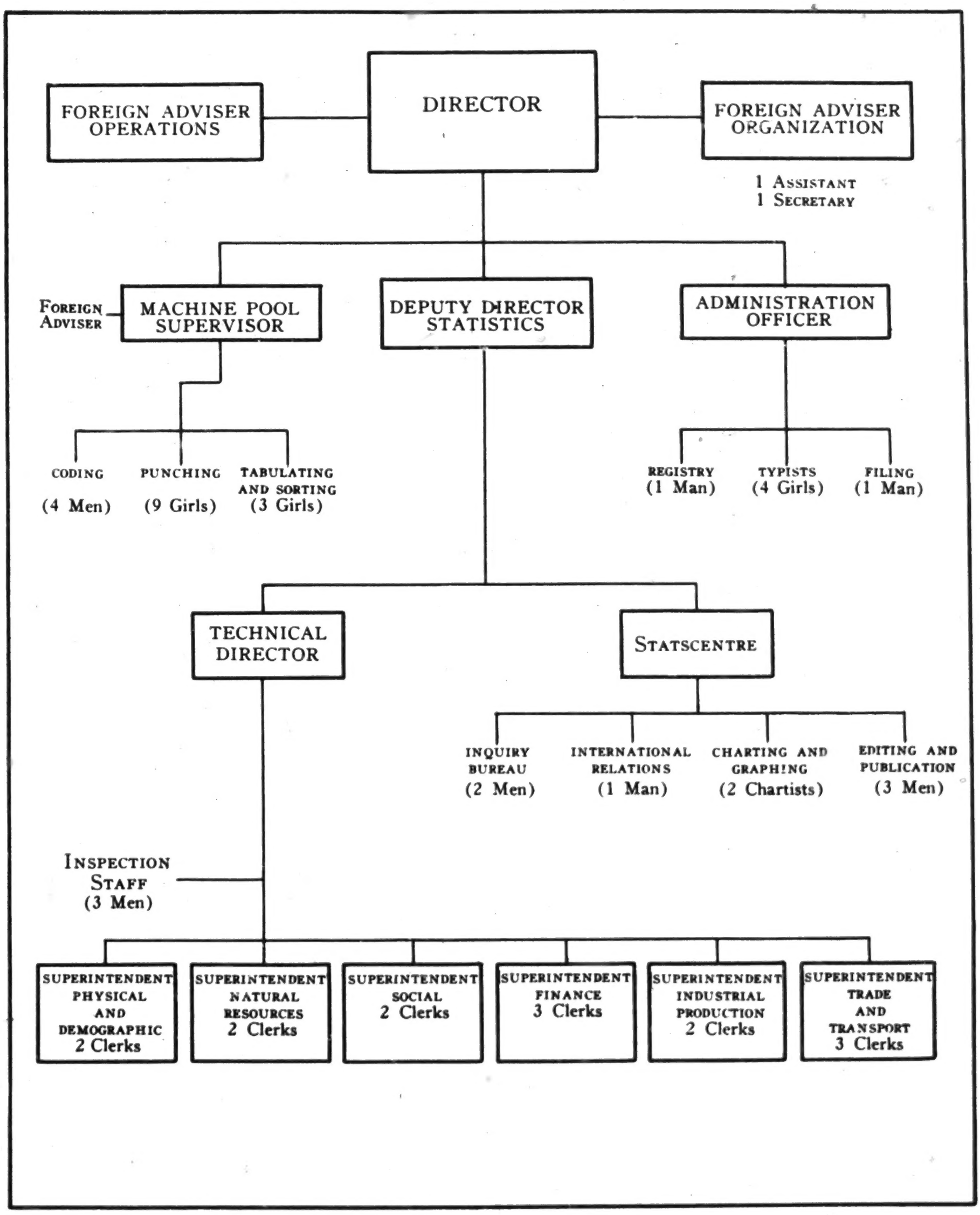
	Notes Weather and Other	Motor Bicycles and Miscel-laneous	Animal Drawn Vehicles	Pack Animals			Buses
				Camels	Donkeys	Horses	
Going East							
Going West							

Enumerator's Name..... Sheet Number.....of.....

Trucks						Cars		Hours
Empty			Loaded			Taxis	Privates	
10 Tons and Over	5-9	Under 5 Tons	10 Tons and Over	5-9	Under 5 Tons			

Exhibit P-10

THE PROPOSED ORGANIZATION FOR THE CENTRAL STATISTICAL BUREAU



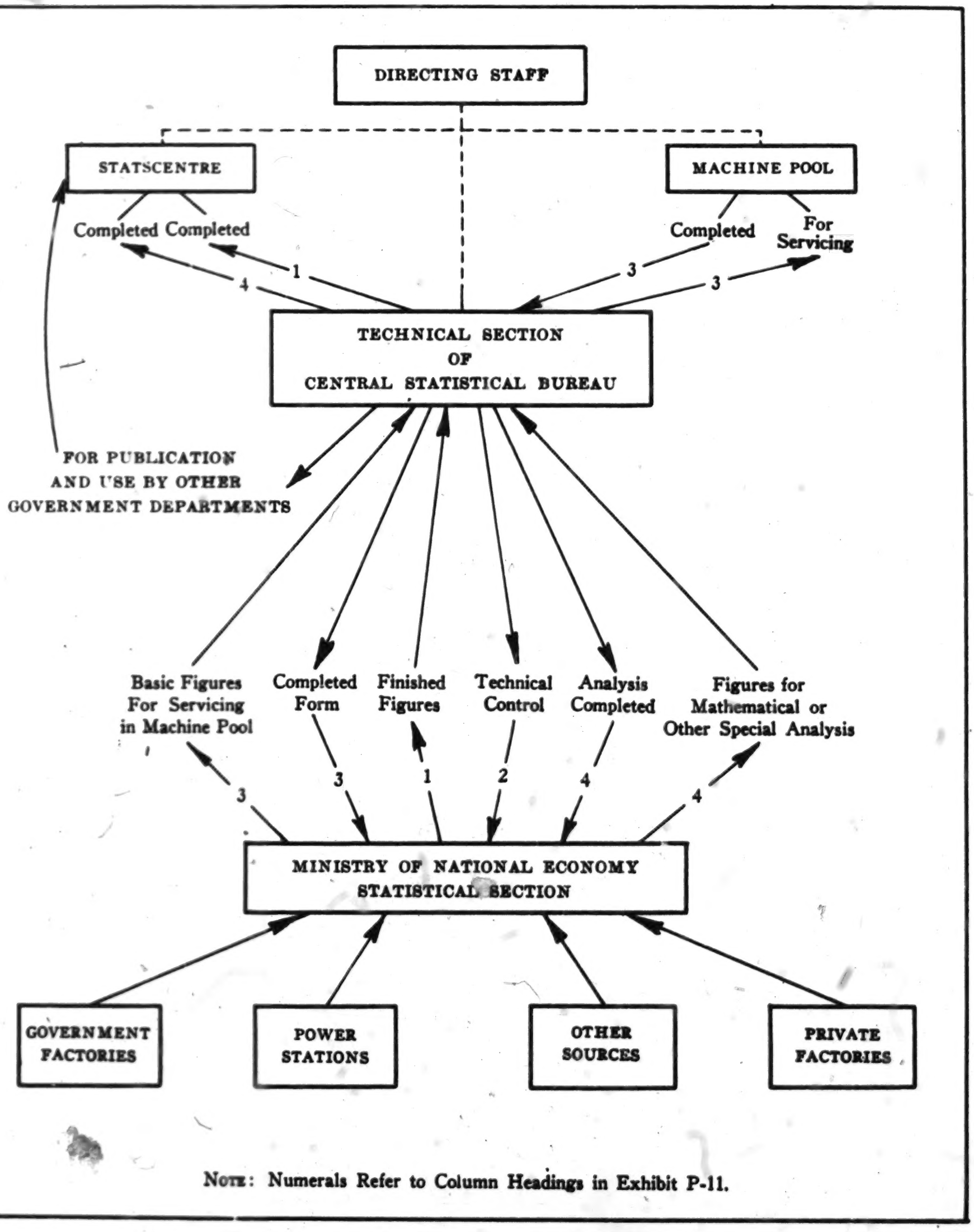
THE STATISTICS TO BE DEALT WITH BY THE CENTRAL STATISTICAL BUREAU

Text Reference	1 Finished Figures to be Received by Central Bureau	2 Technical Control Furnished by Central Bureau (Specific Recommendations)	3 Service to be Furnished by Machine Pool	4 Basic Figures to Receive Special Analysis
Cartographic Survey	Areas and other geographic data	—	—	—
Climatic Statistics	Regular information on climate — monthly service	Guidance on practical angle and design of forms. Technical facilities	—	—
Population Census	Complete results	Liaison to ensure that needs of other departments are met, such as Distribution	Assistance in tabulation in occupation part of census	Assistance and calculation of mortality ratios
Mortality Statistics	Mortality data	Participation in investigation commission in regard to re-organization	Possibly placing of births and deaths on machines	Assistance and calculation of ratios
Public Health	Regular data on morbidity	Assistance in design of card index. Provision of census data to Ministry of Health	—	—
Municipal Organization and Ministry of Interior	—	Participation in commission	—	—
Housing	—	Provision of statistics of population and so on to Housing Authority	—	—
Social Insurance	—	Discussions prior to census to insure figures are in form required for social insurance	—	Calculation and analysis of figures which may be required by social insurance organization
Education	All education data	Provision of figures on literacy to the Ministry	—	—
Justice and Crime	—	Examination of police records. Participation in commission to reorganize Ministry of Justice figures	Possible utilization of pool for Ministry of Justice figures	—
Labor	Receipt of figures	Participation in commission to simplify employment system	Possible use of punched cards for employment index	—
Defense	—	—	—	—
Land Settlement	—	—	Card index of land settlement	Studies of land tenure system
Water Resources	General statistics	—	—	—
Agriculture	All agricultural figures	—	Possible use for agricultural census	Derived agricultural statistics
Forestry	Forest utilization figures	Advice on methods and techniques. Provision of figures of imports, exports and forest industries to Forest Department	—	—
Fisheries	—	Establishment of liaison with Department of Concessions and Mines	—	—
Oil and Minerals	Regular receipt of figures on oil from Government corporation. Figures on mineral production from Ministry of National Economy	—	—	—
Electricity	Annual figures	—	—	—

Text Reference	1. Finished Figures to be Received by Central Bureau	2. Technical Control Furnished by Central Bureau (Specific Recommendations)	3. Service to be Furnished by Machine Pool	4. Basic Figures to Receive Special Analysis
Industrial Production—Private Factories	Receipt of regular figures	Assistance in organizing census of production	Tabulation of census of production	Calculation of indices of industrial production
Production—Industrial Bank	Receipt of figures through Industrial Bank	Close co-ordination with foreign specialist on cost accounting	—	—
Production—Tobacco Monopoly	—	—	—	—
Commerce and Distribution	—	Provision of figures to Ministry of National Economy section from sources outside that Ministry. Provision to marketing section of Plan of results of census questions on occupation	—	Investigations into income and buying power, and so on. Also retail trade. Collection of volume of trade. Early study of stocks on hand
Foreign Trade	Trade figures	Check of valuation	—	Calculation of index numbers
Railroads	Traffic figures	—	Study for possible use of punched cards	—
Roads	Traffic census results. Statistics from any bus organization and from Police Department on taxis and cars	Assistance in organizing traffic census and Police Department vehicle registration	Possible use for vehicle registration	—
Ports	Regular statistics	—	—	—
Aviation	Regular statistics	—	—	—
Posts and Tele-communications	—	—	—	Organization of commercial survey
National Income	—	—	—	Eventual takeover and calculation
Balance of Payments	Receipt of calculations	—	—	—
Currency	Receipt of figures	—	—	—
Exchange	—	—	Trial run of statistics	—
Banking	Receipt of balance sheets	—	—	Build-up of figures of bank deposits
Income Tax	—	Participation in reorganization of records	Placing on machines	—
Indirect Taxation	—	Participation in commission as above	—	—
Government Accounts	—	Participation in special commission and working party to examine all Ministry of Finance figures	—	—
Wholesale Prices	Receipt of results	—	—	Technical assistance in re-design
Cost-of-Living Index	Receipt of results after new study	—	—	Assistance in new study
Registration of Companies	—	—	—	—
Civil Service Personnel and Pensions	—	Advice on re-organization	Construction of personal card index	—

Exhibit P-12

A TYPICAL RELATIONSHIP BETWEEN A MINISTRY (NATIONAL ECONOMY) AND THE CENTRAL STATISTICAL BUREAU



NOTE: Numerals Refer to Column Headings in Exhibit P-11.

THE RELEVANCE OF AND SOURCE OF BUDGET FOR THE DIVISIONS OF THE PROPOSED STATISTICAL PROGRAM

Division (Text Reference)	Department to Which Relevant (in Addition to the Central Bureau)	Source of Budget*
Cartographic Survey	Water Authority, Ministry of Agriculture, Census	Plan funds, seen as the fifth item in Chapter VI
Meteorological Statistics	Water Authority, Irrigation Department, Ministry of Agriculture	Plan funds, the first item in Chapter I
Population Census	Census Department, Water Authority (Survey)	Part Plan funds and part from special Government budget
Civil Registration	Civil Registration Department, Police (for migration)	Census allocation and Ministry revenues
Public Health	Ministry of Health, Insurance Company of Iran, Ministry of Labor	Plan funds for Public Health
Ministry of the Interior	Ministry of the Interior, Census Department	To be decided
Housing	Housing Authority, Census Department	Plan funds for Housing
Social Insurance	Insurance Company of Iran, Ministry of Labor, Civil Registration Department	From revenue of Iran Insurance Company
Education	Ministry of Education	Plan funds for Education
Justice	Ministry of Justice, Police Department	Ordinary revenues
Labor	Ministry of Labor, Insurance Company of Iran, Bank Melli	Primarily Ministry revenues, if inadequate part from fourth item Chapter VI of Plan
Land Settlement	Ministry of Justice Ministry of Agriculture	Revenues of Ministry of Justice
Water Resources	Proposed Water Authority, Ministry of Agriculture	Plan funds, the fifth item in Chapter I, Irrigation
Agriculture	Ministry of Agriculture	Plan funds, the first item of Chapter I
Forestry	Forestry Department, Ministry of Agriculture	Plan funds, the third item in Chapter I
Fisheries	Fishery Department, Ministry of Agriculture	Plan funds, Chapter I
Oils and Minerals	Proposed Oil Company, Ministry of National Economy, Department of Concessions and Mines, Ministry of Finance	Revenues of Ministry of National Economy
Electrical Power	Municipalities Department, Ministry of Interior, Ministry of National Economy	Ordinary revenues of Ministry of National Economy

* References are to item and chapter of the Seven Year Development Plan Legislation.

Division (Text Reference)	Department to Which Relevant (in Addition to the Central Bureau)	Source of Budget*
Industrial Production: Private Factories	Ministry of National Economy	Ordinary revenues of the Ministry
Production: Industrial Bank	Industrial Bank	Plan funds, Chapter III
Production: Tobacco Monopoly	Tobacco Monopoly	From its own revenues
Commerce and Distribution	Ministry of National Economy	Ministry of National Economy; also Central Statistical Bureau
Foreign Trade	Customs Department	From customs revenues
Railroads	Iran State Railways	Plan funds, Chapter II
Roads	Ministry of Roads, Police Department	Plan funds, Chapter II
Ports	Ports Department, Iran State Railways, Customs	Plan funds, Chapter II
Air	Department of Civil Aviation	Plan funds, Chapter II
Posts & Telegraph	Ministry of Posts and Telegraphs	Plan funds, Chapter III
National Income	Bank Melli	——
Balance of Payments	Bank Melli, Customs	——
Currency	Bank Melli	——
Exchange	Bank Melli	——
Banking	Bank Melli	Bank Melli revenues
Income Tax	Direct Taxation Department of the Ministry of Finance	Ordinary revenues of Ministry
Indirect Taxation	Indirect Tax Department	Ordinary revenues
Government Accounts	Ministry of Finance	Ordinary revenues
Wholesale Prices	Bank Melli	Bank Melli revenues
Cost-of-Living Index	Bank Melli	Bank Melli revenues
Registration of Companies	Ministry of Justice Bank Melli	——
Civil Service Personnel	Ministry of Finance	Ordinary revenues of the Ministry

* References are to item and chapter of the Seven Year Development Plan Legislation.

Exhibit Q-1

WHOLESALE AND RETAIL PRICES OF THREE BASIC COMMODITIES

Showing the Difference in Per Cent of the Wholesale Price

Year and Month	Tea (100 g) Wholesale Price (Rials)	Tea (100 g) Retail Price (Rials)	Tea (100 g) Per Cent Difference	Cheese (1 kg) Wholesale Price (Rials)	Cheese (1 kg) Retail Price (Rials)	Cheese (1 kg) Per Cent Difference
1324						
Farvardin	33.00	40.00	21.2	31.50	35.00	11.1
Tir	38.25	40.00	4.6	25.00	30.00	20.0
Mehr	30.20	35.00	15.9	35.00	52.00	48.6
Dey	28.00	35.00	25.0	47.00	60.00	27.7
1325						
Farvardin	28.00	35.00	25.0	35.00	37.75	7.9
Tir	25.25	35.00	38.6	27.00	27.00	–
Mehr	23.60	29.00	22.9	32.50	45.50	40.0
Dey	23.75	25.50	7.4	34.25	50.50	47.4
1326						
Farvardin	13.50	20.20	49.6	22.00	27.50	25.0
Tir	12.00	19.00	58.3	26.00	27.00	3.8
Mehr	10.50	24.50	133.3	27.25	30.50	11.9
Dey	12.00	13.00	8.3	30.00	40.00	33.3
1327						
Farvardin	15.15	21.00	38.6	31.50	37.50	19.0
Tir	14.75	17.00	15.3	35.00	38.50	10.0
Mehr	13.23	15.00	13.4	40.25	42.50	5.6
Dey	16.00	19.00	18.8	50.50	57.00	12.9

Year and Month	Sugar (1 kg) Wholesale Price (Rials)	Sugar (1 kg) Retail Price (Rials)	Sugar (1 kg) Per Cent Difference
1324			
Farvardin	65.50	75.00	14.5
Tir	57.51	60.50	5.2
Mehr	57.08	64.00	12.1
Dey	83.92	93.00	10.8
1325			
Farvardin	45.38	52.00	14.6
Tir	45.66	49.15	7.6
Mehr	69.00	72.00	4.3
Dey	86.00	88.65	3.1
1326			
Farvardin	51.25	75.00	46.3
Tir	56.00	61.00	8.9
Mehr	56.00	72.00	28.6
Dey	48.00	54.00	12.5
1327			
Farvardin	23.80	26.00	9.2
Tir	21.33	26.00	21.9
Mehr	23.20	27.50	18.5
Dey	24.20	26.25	8.5